



Drinking Water Surveillance Program

**THUNDER BAY
(LOCH LOMOND)
WATER TREATMENT
PLANT**

Annual Report 1988



**Environment
Environment
Environment**

91-02667/

THUNDER BAY (LOCH LOMOND)
WATER TREATMENT PLANT

DRINKING WATER SURVEILLANCE
PROGRAM

ANNUAL REPORT 1988

FEBRUARY 1990



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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

THUNDER BAY (LOCH LOMOND) WATER TREATMENT PLANT 1988 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. Currently, 52 plants are being monitored.

The Thunder Bay (Loch Lomond) Water Treatment Plant treats water from Loch Lomond. The water is disinfected and sodium silicate is added for corrosion control. This plant has a design capacity of $54.55 \times 1000 \text{ m}^3/\text{day}$ and together with the Bare Point Supply serves a population of approximately 113,000.

Water samples from two distribution system sites were taken on a monthly basis beginning in May, sampling of the raw and treated water began in September. The Thunder Bay (Loch Lomond) Water Treatment Plant was sampled for approximately 160 parameters. Parameters were divided into the following groups: Bacteriological, Inorganic and Physical (Laboratory Chemistry, Field Chemistry and Metals) and Organic (Chloroaromatics, Chlorophenols, Pesticides and PCB, Phenolics, Polynuclear Aromatic Hydrocarbons, Specific Pesticides and Volatiles). Chlorophenols and Specific Pesticides were analysed for in November only.

A summary of results is shown in Table 1.

Inorganic and Physical parameters were below any applicable health related ODWOs.

Of a total of approximately 110 Organic parameters tested for on a monthly basis, none exceeded health related guidelines.

While the parameters measured on DWSP may not have exceeded drinking water guidelines, the water produced cannot be considered to be satisfactory until a treatment process appropriate to the source of the supply is applied (see ODWOs revised 1983 p7).

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOCHOW MTP)

SUMMARY TABLE BY SCAN

SCAN	RAW			TREATED			SITE 1			SITE 3		
	TESTS	POSITIVE	% POSITIVE	TESTS	POSITIVE	% POSITIVE	TESTS	POSITIVE	% POSITIVE	TESTS	POSITIVE	% POSITIVE
BACTERIOLOGICAL	9	3	33	7	1	14	26	6	23	26	3	11
CHEMISTRY (FLD)	11	11	100	15	15	100	46	46	100	74	74	100
CHEMISTRY (LAB)	80	53	66	60	45	75	227	179	78	278	232	83
METALS	96	30	31	72	26	36	307	125	40	376	149	39
CHLORODROMATICS	56	0	0	42	0	0	112	0	0	112	0	0
CHLOROPHENOLS	6	0	0	6	1	16	.	.	.	.	.	.
PAH	68	0	0	51	0	0	.	.	.	.	.	.
PESTICIDES & PCB	136	0	0	102	0	0	268	0	0	268	0	0
PHENOLICS	4	3	75	3	3	100	.	.	.	.	.	.
SPECIFIC PESTICIDES	28	0	0	28	0	0	0	0	0	0	0	0
VOLATILES	115	2	1	87	10	11	228	24	10	228	24	10
TOTAL	609	102	473	101	1214	360	1362	482				

NO HEALTH RELATED GUIDELINES WERE EXCEEDED

A POSITIVE VALUE DEMOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
 A '.' INDICATES THAT NO SAMPLE WAS TAKEN

DRINKING WATER SURVEILLANCE PROGRAM
THUNDER BAY (LOCH LOMOND) WATER TREATMENT PLANT
1988 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. Currently, 52 plants are being monitored. Appendix A contains a detailed description of the DWSP.

The DWSP was initiated at the Thunder Bay (Loch Lomond) Water Treatment Plant in May 1988 with sampling of the distribution system. Sampling at the treatment plant began in September.

This report contains information and results for 1988.

PLANT DESCRIPTION

The Thunder Bay (Loch Lomond) Water Treatment Plant treats water from Loch Lomond. The water is gravity fed into a valve chamber where it is disinfected. Sodium silicate is added for corrosion control. This plant has a rated capacity of $54.55 \times 1000 \text{ m}^3/\text{day}$ and daily flows ranging from $26.5 \times 1000 \text{ m}^3/\text{day}$ to $46.4 \times 1000 \text{ m}^3/\text{day}$.

The plant together with the Bare Point serves a population of 113,000.

The plant location is shown in Figure 1. Plant process details, in a block schematic, are shown in Figure 2. General plant information is presented in Table 2.

METHODS

Water samples were obtained from four DWSP approved locations;

- i) Plant Raw - The water originated from the raw water wet well prior to chlorination and was sampled through a stainless steel sample line. The sample tap is located near the wet well.
- ii) Plant Treated - The water originated from the reservoir after addition of all treatment chemicals and was sampled through a stainless steel sample line. The location of the sample tap is unknown.
- iii) Distribution System - Site 1 - The distance of this house from the plant is unavailable as are the type of sample line and location of sample tap.
- iv) Distribution System - Site 3 - The distance of this house from the plant is unavailable as are the type of sample line and location of sample tap.

FIGURE 1

DRINKING WATER SURVEILLANCE PROGRAM

SITE LOCATION MAP

THUNDER BAY (LOCH LOMOND) WATER SUPPLY SYSTEM



FIGURE 2

THUNDER BAY (LOCH LOMOND) WATER TREATMENT PLANT

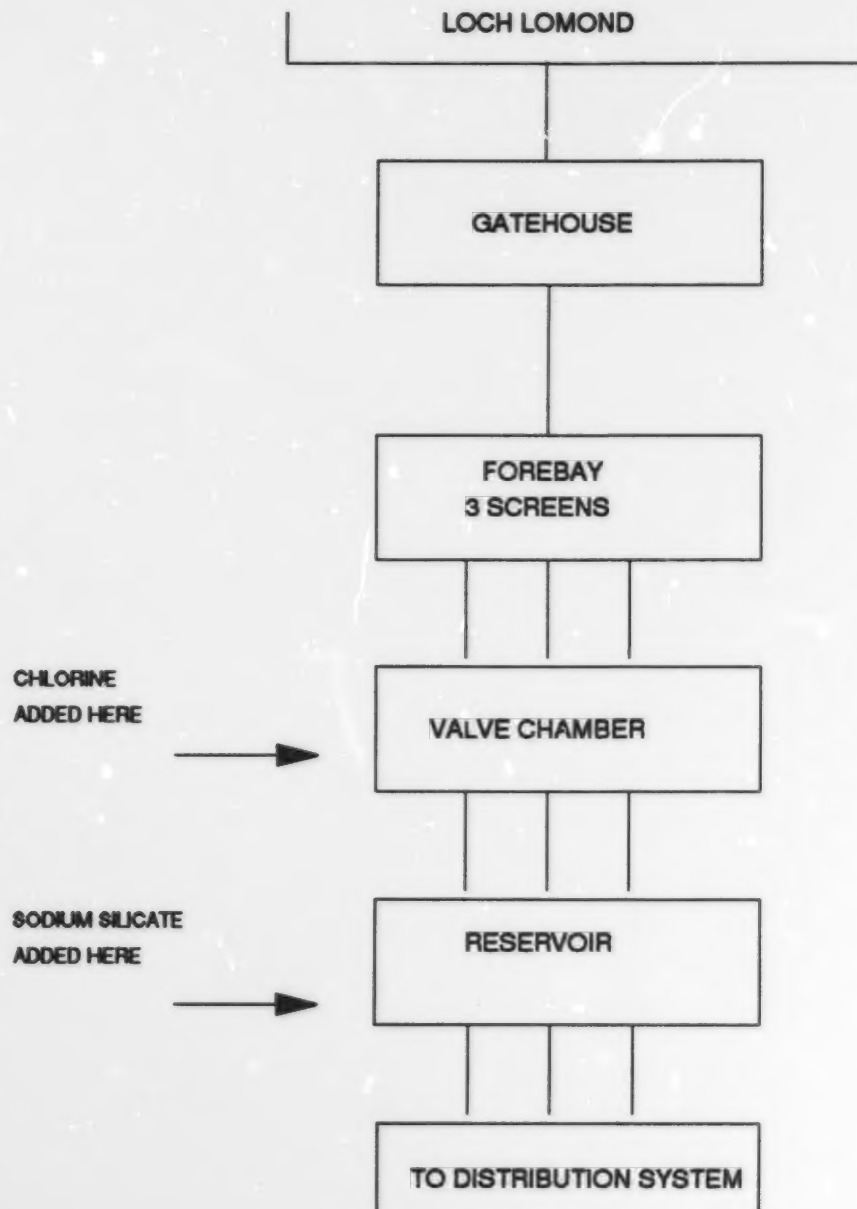


TABLE 2

DRINKING WATER SURVEILLANCE PROGRAM ANNUAL REPORT

GENERAL INFORMATION

THUNDER BAY (LOCH LOMOND) WATER SUPPLY SYSTEM

<u>LOCATION:</u>	LOCH LOMOND INDIAN RESERVE THUNDER BAY, ONTARIO (807-625-2471)
<u>SOURCE:</u>	RAW WATER SOURCE - LOCH LOMOND
<u>RATED CAPACITY:</u>	54.55 (1000 M ³ /DAY)
<u>OPERATION:</u>	MUNICIPAL
<u>PLANT SUPERINTENDENT:</u>	R. ROMANICK
<u>MINISTRY REGION:</u>	NORTHWEST
<u>DISTRICT OFFICER:</u>	D. MURRAY

MUNICIPALITY
SERVED

THUNDER BAY

POPULATION

113,000

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At the distribution system location two types of samples were obtained: a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples are used to make an assessment of the amount by which the levels of inorganic compounds and metals may be changed on standing due to leaching from (or deposition on) the plumbing system. The only analyses carried out on the standing samples therefore, are General Chemistry and Metals. The free flow sample represented fresh water from the distribution main that had been flowing at the sample tap for five minutes before being sampled.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. The retention time was calculated by dividing the volume of water between the two sampling points by the sample day flow. For example, if it was determined that the retention time within the plant was five hours then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site

would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (Appendix B).

Sample day flow, treatment chemical dosages and Field Chemistry measurements such as Turbidity, Chlorine Residuals, pH and Temperature were recorded on the day of sampling and were entered on the DWSP data base as submitted.

RESULTS

The Thunder Bay (Loch Lomond) Water Treatment Plant was sampled for approximately 160 parameters on a monthly basis. Two locations in the distribution system were sampled beginning in May. Water at the plant was sampled beginning in September following installation of DWSP approved stainless steel sample lines.

The Specific Pesticides and Chlorophenols scans were sampled for in November only. Polynuclear Aromatic Hydrocarbons and Phenolics were only analysed for in the raw and treated water at the plant.

Table 3 contains information on the sample day retention time, flow rate and treatment chemicals used and their associated dosages.

Table 4 is a summary break-down of the number of water samples

analysed for by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment (MOE) laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analysed in the DWSP.

Associated guidelines and detection limits are also supplied on both tables. Parameters are listed alphabetically within each scan.

DISCUSSION

General

Water quality is judged by comparison with the Ontario Drinking Water Objectives (ODWOs) as defined in the 1984 publication (ISBN 0-7743-8985-0). The Province of Ontario has health related and aesthetic objectives for 49 parameters, these are currently

under review. When an ODWO is not available guidelines/limits from other agencies are consulted. The Parameters Listing System (PALIS) recently published (ISBN 0-7729-4461-X) by the MOE catalogues and keeps current over 1750 guidelines for 650 parameters from agencies throughout the world.

Although some of the parameters measured on DWSP may be present in the raw and treated water as a result of pollution, many of the compounds detected are naturally occurring or are treatment by-products.

Plant operational personnel address occurrences of taste and odour or biological water quality parameters. The DWSP does not assess these aspects of the water supply.

As stated under Results, traces do not indicate quantifiable values, as defined by established MOE Laboratory analytical reporting protocols. The occasional finding of a trace level of a contaminant is thus not considered to be significant. They can be useful in trend analysis, or confirmation of the presence of a specific contaminant that is repeatedly detected at these levels.

DISCUSSION OF GUIDELINES AND LIMITS THEREFORE, IS ONLY CONDUCTED ON POSITIVE RESULTS.

Bacteriology

Positive results for the Bacteriology scan were present once in the treated water, six times in the Site 1 water sample and three times in the Site 3 water sample. The positive parameters were Standard Plate Count and Total Coliform Background.

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality; the routine monitoring program usually requires the taking of multiple samples in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples. Further, bacteriological limits were developed in acknowledgement that the presence of coliforms may be detected due to their non-uniform distribution throughout the distribution system and the fact that their enumeration is subject to considerable variation. Routine bacteriological monitoring, as outlined in the ODWOs is carried out by the operating authority.

Inorganic and Physical Parameters

Laboratory and Field Chemistry

The results for Laboratory and Field Chemistry scans were below any applicable health related ODWOs.

Turbidity in water is caused by the presence of suspended matter

such as clay, silt, colloidal particles, plankton and other microscopic organisms. The most important potential health effect of Turbidity is its interference with disinfection in the treatment plant and maintenance of a chlorine residual. The ODWO of 1 Formazin Turbidity Unit (FTU) is only applicable to water leaving the plant.

The Langelier Index is used extensively in estimating the corrosion potential of water. An increasingly negative index indicates the increasing possibility of corrosion. It is considered sound engineering practice to maintain a slightly positive Langelier Index. The Langelier Index for Loch Lomond is consistently negative.

Colour values exceeded the aesthetic ODWO of 5 True Colour Units (TCU) in three treated water samples, thirteen Site 1 standing and free flow samples and sixteen Site 3 samples. Colour in drinking water may be due to the presence of natural or synthetic organic substances as well as certain metallic ions.

Metals

The results reported for the Metal scan were below any applicable ODWOs.

High levels of Copper, Lead and Zinc were detected in the standing samples as compared to the free flow distribution samples,

indicating that these metals were leached from the household plumbing as the water stood overnight. The Langelier Index indicates a potential for corrosion and some metals will be leached in standing samples.

Although the ODWO for lead of 50 ug/L applies to the free flow water, the lead value was above 50 ug/L in three Site 1 standing waters. At this location lead concentrations were higher in both the standing and the free flow samples, possibly due to a lead service connection.

Organic Parameters

Chloroaromatics

The results of the Chloroaromatics scan showed that no chloroaromatics were detected.

Chlorophenols

The results of the Chlorophenol scan showed that one Chlorophenol was detected:

2,4,6-Trichlorophenol

2,4,6-Trichlorophenol was detected in one treated water sample at 210 ng/L. This is below Health and Welfare Canada's Maximum Acceptable Concentration (MAC) of 5000 ng/L.

Pesticides and PCB

Results of the Pesticides and PCB scan showed that no PCBs were detected and that two pesticides were detected:

Alpha BHC

Lindane

There are several isomers of BHC (benzene hexachloride); gamma BHC is the active ingredient of the pesticide Lindane, while alpha BHC is the isomer most predominantly found in surface waters of the Great Lakes basin as indicated by results from other water supplies on DWSP.

Alpha BHC was detected at trace levels, in two raw water samples, two treated water samples, five Site 1 and eight Site 3 water samples.

Lindane was detected at a trace level, once in a Site 3 water sample.

Specific Pesticides

The results of the Specific Pesticide scan showed that none were detected.

Phenolics

Phenolics were detected three times in both the raw water and the treated water at 1.8 ug/L and 2.4 ug/L in October, 2.0 ug/L and 2.6

ug/L in November and 2.0 ug/L and 1.0 ug/L in December respectively. It was also detected at a trace level in the September raw water sample. The maximum desirable concentration of phenolic substances in drinking water is 2.0 ug/L. This limit has been set primarily to prevent the occurrence of undesirable tastes and odours, particularly in chlorinated water. Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes.

Polynuclear Aromatic Hydrocarbons (PAH)

The results of the PAH scan showed that no PAHs were detected.

Volatiles

The results of the Volatile scan showed that four parameters, other than Trihalomethanes (THMs) were detected:

Toluene

Ethylbenzene

Meta-Xylene

Styrene

Toluene was detected at trace levels, twice in the raw water, once in the treated water and once in a Site 1 water sample. The detection of toluene at low, trace levels is a laboratory artifact derived from the analytical methodology. The purge-and-trap analytical technique depends on the purging of the volatile organics in the water sample with helium gas onto a Tenax trapping

column. The volatile materials are subsequently thermally desorbed, separated and quantified. Tenax, a toluene-like polymeric material, tends to decompose sporadically upon heating into toluene and other aromatic componenets (ethylbenzene and xylene) giving instrument blanks in the order of 0.05 ug/L.

The detected trace levels of Styrene are also considered to be laboratory artifacts due to the outgassing of monomeric styrene from the polystyrene shipping containers. The sporadic background levels from this source are in the order of 0.05 ug/L.

Ethylbenzene was detected at trace levels, twice in the raw water, once in the treated water, five times in the Site 1 water and twice in the Site 3 water samples.

Meta-Xylene (M-Xylene) was detected at a trace level, once in a Site 1 water sample.

The volatiles listed above are typically found on an occasional basis at other water supplies included on the DWSP, usually at trace levels.

THMs are known to be produced during the water treatment process and will always occur in chlorinated surface waters. THMs are comprised of Chloroform, Chlorodibromomethane and ichlorobromomethane. Bromoform occurs occasionally. Results are

reported for the individual compounds as well as for total THMs.

Chloroform, Dichlorobromomethane and Total THMs were detected in all treated waters. Chlorodibromomethane was detected at trace levels, once in both distribution system waters. Bromoform was not detected. All Total THM occurrences, ranging from 118 ug/L to 180.85 ug/L were well below the ODWO of 350 ug/L.

CONCLUSIONS

Effective treatment should be provided to ensure safety and consistency in the quality of all waters. The current Ministry policy (#15-14-01) requires that all surface waters shall use treatment processes consisting of coagulation-flocculation, filtration (or equivalent) and disinfection. Surface supplies without such treatment are subject to contamination with biological organisms, including algae, protozoa and other organisms that can cause taste and odour and other aesthetic problems in the distributed water.

While the parameters measured may not have exceeded drinking water guidelines, the water produced cannot be considered to be satisfactory until a treatment process appropriate to the source of the supply is applied (see ODWOs p.7).

No health related guidelines, for organic or inorganic parameters,

were exceeded during 1988.

RECOMMENDATIONS

Two recommendations can be made:

- 1) Consideration should be given to applying treatment appropriate to the supply.
- 2) The process used for corrosion control should be reviewed.

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCK LOWMO VTP) SAMPLE DAY CONDITIONS 1988

SAMPLE DAY CONDITIONS		TREATMENT CHEMICAL DOSAGES (MG/L)		
DATE	RETENTION TIME (HRS) (1000 L3)	PRE-CHLORINATION	CORROSION CONTROL	
		CHLORINE	SODIUM SILICATE	
MAY 10	.	02.77	11.10	
JUN 14	.	03.15	10.09	
JUL 12	46.4	03.52	11.60	
SEP 13	32.9	03.52	14.60	
OCT 17	28.4	04.05	14.10	
NOV 15	26.5	03.27	15.60	
DEC 13	.	03.52	17.22	

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP)

SUMMARY TABLE OF RESULTS (1988)

SCAM	PARAMETER	RAW		TREATED		SITE 1		SITE 3	
		TOTAL	POSITIVE TRACE	TOTAL	POSITIVE TRACE	TOTAL	POSITIVE TRACE	TOTAL	POSITIVE TRACE
BACTERIOLOGICAL	FECAL COLIFORM MF	3	0	0	.	.	.	.	.
	FECAL COLIFORM	.	.	.	1	0	0	1	0
	FECAL STREPTO MF	1	0	0	.	.	.	.	.
	STANDARD PLATE CNT MF	.	.	.	2	1	0	7	3
	P/A BOTTLE	.	.	.	.	.	.	4	0
	COLIFORM	.	.	.	1	0	0	1	0
	TOTAL COLIFORM MF	3	1	0	2	0	0	7	0
	T COLIFORM BCKGRD MF	2	2	0	1	0	0	6	0
*TOTAL SCAN BACTERIOLOGICAL		9	3	0	7	1	0	26	3
*TOTAL GROUP BACTERIOLOGICAL		9	3	0	7	1	0	26	3
CHEMISTRY (FLD)	FLD CHLORINE (COMB)	.	.	.	2	0	0	9	0
	FLD CHLORINE FREE	.	.	.	3	0	0	9	0
	FLD CHLORINE (TOTAL)	.	.	.	3	0	0	9	0
	FLD PH	4	4	0	3	0	0	11	0
	FLD TEMPERATURE	4	4	0	3	0	0	8	0
	FLD TURBIDITY	3	3	0	1	0	0	.	.
*TOTAL SCAN CHEMISTRY (FLD)		11	11	0	15	0	46	0	74
CHEMISTRY (LAB)	ALKALINITY	4	4	0	3	0	0	13	0
	CALCIUM	4	4	0	3	0	0	13	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND UTP)

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	SITE	RAW			TREATED			SITE 1			SITE 3		
			TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
CHEMISTRY (LAB)														
	CYANIDE	4	0	0	0	3	0	0	8	0	0	8	0	0
	CHLORIDE	4	2	1	3	3	3	0	13	13	0	16	16	0
	COLOUR	4	4	0	0	3	3	0	13	13	0	16	16	0
	CONDUCTIVITY	4	4	0	0	3	3	0	13	13	0	16	16	0
	FLUORIDE	4	1	3	3	3	0	3	13	1	12	16	2	14
	HARDNESS	4	4	0	0	3	3	0	13	13	0	16	16	0
	IONICAL	4	4	0	0	3	3	0	13	13	0	16	16	0
	LANGELIERS INDEX	0	0	0	0	0	0	0	2	2	0	2	2	0
	MAGNESIUM	4	4	0	0	3	3	0	13	13	0	16	16	0
	SODIUM	4	1	3	3	3	3	0	13	13	0	16	16	0
	AMMONIUM TOTAL	4	2	2	3	3	2	1	13	8	5	16	14	2
	NITRITE	4	2	2	3	3	1	2	13	5	8	16	6	10
	TOTAL NITRATES	4	1	3	3	3	1	2	13	2	10	16	6	7
	NITROGEN TOT KJELD	4	4	0	0	3	3	0	13	13	0	16	16	0
	PH	4	4	0	0	3	3	0	13	13	0	16	16	0
	PHOSPHORUS FIL REACT	4	0	3	3	3	1	2	0	0	0	16	16	0
	PHOSPHORUS TOTAL	4	0	4	3	3	1	2	0	0	0	0	0	0
	SULPHATE	4	4	0	0	3	3	0	9	9	0	12	12	0
	TURBIDITY	4	4	0	0	3	3	0	13	13	0	16	16	0
*TOTAL SCAN CHEMISTRY (LAB)			80	53	21	60	45	12	227	179	35	278	232	33
METALS														
	SILVER	4	0	0	0	3	0	1	13	0	7	16	0	11
	ALUMINIUM	4	4	0	0	3	3	0	13	13	0	16	16	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP)

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	SITE			TREATED			SITE 1			SITE 3		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS	ARSENIC	4	0	4	3	0	3	13	0	11	16	0	16
	BARIUM	4	4	0	3	3	0	13	13	0	16	16	0
	BORON	4	1	3	3	0	3	13	2	11	16	3	13
	BERYLLIUM	4	0	2	3	0	1	13	0	6	16	0	8
	CADMIUM	4	0	0	3	0	0	13	1	4	16	0	0
	COBALT	4	0	3	3	0	3	13	0	12	16	0	15
	CHROMIUM	4	3	1	3	2	1	13	4	7	16	1	6
	COPPER	4	4	0	3	3	0	13	13	0	16	16	0
	IRON	4	0	4	3	0	3	13	3	10	16	0	16
	MERCURY	4	0	3	3	1	1	8	1	5	8	0	1
	MANGANESE	4	3	1	3	3	0	13	13	0	16	16	0
	MOLYBDENUM	4	0	4	3	0	3	13	0	13	16	0	16
	NICKEL	4	0	4	3	1	2	13	1	9	16	7	9
	LEAD	4	1	3	3	1	2	13	13	0	16	16	0
	ANTIMONY	4	3	1	3	2	1	13	9	4	16	10	6
	SELENIUM	4	0	1	3	0	2	13	0	6	16	0	6
	STRONTIUM	4	4	0	3	3	0	13	13	0	16	16	0
	TITANIUM	4	3	1	3	3	0	13	13	0	16	16	0
	THALLIUM	4	0	0	3	0	0	13	1	4	16	0	2
	URANIUM	4	0	0	3	0	0	13	0	5	16	0	6
	VANADIUM	4	0	4	3	0	3	13	1	12	16	0	16
	ZINC	4	0	4	3	1	2	13	11	2	16	16	0
*TOTAL SCAN METALS		96	39	43	72	26	31	307	125	128	376	149	147
*TOTAL GROUP INORGANIC & PHYSICAL		187	94	64	147	86	43	580	350	163	728	455	180

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP)

SUMMARY TABLE OF RESULTS (1988)

SCAM	PARAMETER	SITE		TREATED		SITE 1		SITE 3	
		TOTAL	POSITIVE TRACE	TOTAL	POSITIVE TRACE	TOTAL	POSITIVE TRACE	TOTAL	POSITIVE TRACE
CHLOROMONATICS	HEXACHLOROCYCLOPENTADIENE	4	0	0	3	0	0	8	0
	123 TRICHLOROBENZENE	4	0	0	3	0	0	8	0
	1234 T-CHLOROBENZENE	4	0	0	3	0	0	8	0
	1235 T-CHLOROBENZENE	4	0	0	3	0	0	8	0
	124 TRICHLOROBENZENE	4	0	0	3	0	0	8	0
	1245 T-CHLOROBENZENE	4	0	0	3	0	0	8	0
	135 TRICHLOROBENZENE	4	0	0	3	0	0	8	0
	HCB	4	0	0	3	0	0	8	0
	HEXACHLOROETHANE	4	0	0	3	0	0	8	0
	OCTACHLOROSTYRENE	4	0	0	3	0	0	8	0
CHLOROMONATICS	PENTACHLOROBENZENE	4	0	0	3	0	0	8	0
	236 TRICHLOROTOLUENE	4	0	0	3	0	0	8	0
	245 TRICHLOROTOLUENE	4	0	0	3	0	0	8	0
	246 TRICHLOROTOLUENE	4	0	0	3	0	0	8	0
*TOTAL SCAM CHLOROMONATICS		56	0	0	42	0	0	112	0
CHLOROPHENOLS	234 TRICHLOROPHENOL	1	0	0	1	0	0	.	.
	2345 T-CHLOROPHENOL	1	0	0	1	0	0	.	.
	2356 T-CHLOROPHENOL	1	0	0	1	0	0	.	.
	245-TRICHLOROPHENOL	1	0	0	1	0	0	.	.
	246-TRICHLOROPHENOL	1	0	0	1	1	0	.	.
*TOTAL SCAM CHLOROPHENOLS		6	0	0	6	1	0	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOCHMID MTP)

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	SITE		RAW		TREATED		SITE 1		SITE 3	
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL
PAH	PHENANTHRENE	4	0	0	3	0	0	0	0	0	0
	ANTHRACENE	4	0	0	3	0	0	0	0	0	0
	FLUORANTHENE	4	0	0	3	0	0	0	0	0	0
	PYRENE	4	0	0	3	0	0	0	0	0	0
	BENZO(A)ANTHRACENE	4	0	0	3	0	0	0	0	0	0
	CHRYSENE	4	0	0	3	0	0	0	0	0	0
	DIMETH. BENZ(A)ANTHR	4	0	0	3	0	0	0	0	0	0
	BENZO(E) PYRENE	4	0	0	3	0	0	0	0	0	0
	BENZO(J) FLUORANTHENE	0	0	0	0	0	0	0	0	0	0
	BENZO(B) FLUORANTHENE	4	0	0	3	0	0	0	0	0	0
	PERYLENE	4	0	0	3	0	0	0	0	0	0
	BENZO(K) FLUORANTHENE	4	0	0	3	0	0	0	0	0	0
	BENZO(A) PYRENE	4	0	0	3	0	0	0	0	0	0
	BENZO(G,H,I) PERYLENE	4	0	0	3	0	0	0	0	0	0
	DIBENZO(A,H) ANTHRAC	4	0	0	3	0	0	0	0	0	0
	INDENO(1,2,3-C,D) PY	4	0	0	3	0	0	0	0	0	0
	BENZO(B) CHRYSENE	4	0	0	3	0	0	0	0	0	0
	ANTHRANTHRENE	0	0	0	0	0	0	0	0	0	0
	CONONE	4	0	0	3	0	0	0	0	0	0
	*TOTAL SCAN PAH	68	0	0	51	0	0	0	0	0	0
PESTICIDES & PCB	ALDRIN	4	0	0	3	0	0	8	0	0	8
	ALPHA BHC	4	0	2	3	0	2	8	0	5	8

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOCHIND MTP)

SUMMARY TABLE OF RESULTS (1985)

SCAN	PARAMETER	SITE			TREATED			SITE 1			SITE 3		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PESTICIDES & PCB	BETA BHC	4	0	0	3	0	0	0	0	0	0	0	0
	LINDANE	4	0	0	3	0	0	0	0	0	0	0	1
	ALPHA CHLORDANE	4	0	0	3	0	0	0	0	0	0	0	0
	GAMMA CHLORDANE	4	0	0	3	0	0	0	0	0	0	0	0
	DIELDRIN	4	0	0	3	0	0	0	0	0	0	0	0
	METHOXYCHLOR	4	0	0	3	0	0	0	0	0	0	0	0
	ENDOSULFAN 1	4	0	0	3	0	0	0	0	0	0	0	0
	ENDOSULFAN 11	4	0	0	3	0	0	0	0	0	0	0	0
	ENDORIN	4	0	0	3	0	0	0	0	0	0	0	0
	ENDOSULFAN SULPHATE	4	0	0	3	0	0	0	0	0	0	0	0
	HEPTACHLOR EPOXIDE	4	0	0	3	0	0	0	0	0	0	0	0
	HEPTACHLOR	4	0	0	3	0	0	0	0	0	0	0	0
	MIREX	4	0	0	3	0	0	0	0	0	0	0	0
	GLYCHLORDANE	4	0	0	3	0	0	0	0	0	0	0	0
	OPDGT	4	0	0	3	0	0	0	0	0	0	0	0
	PCB	4	0	0	3	0	0	0	0	0	0	0	0
	DDD	4	0	0	3	0	0	0	0	0	0	0	0
	PPDDE	4	0	0	3	0	0	0	0	0	0	0	0
	PPDGT	4	0	0	3	0	0	0	0	0	0	0	0
	AMETRINE	4	0	0	3	0	0	0	0	0	0	0	0
	ATRAZINE	4	0	0	3	0	0	0	0	0	0	0	0
	ATRAZONE	4	0	0	3	0	0	0	0	0	0	0	0
	CYANAZINE	4	0	0	3	0	0	0	0	0	0	0	0
	D'S ETHYL ATRAZINE	4	0	0	3	0	0	0	0	0	0	0	0
	DES ETHYL SIMAZINE	4	0	0	3	0	0	0	0	0	0	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP)

SUMMARY TABLE OF RESULTS (1985)

SITE		RAW		TREATED		SITE 1		SITE 3	
SCAN	PARAMETER	TOTAL	POSITIVE TRACE	TOTAL	POSITIVE TRACE	TOTAL	POSITIVE TRACE	TOTAL	POSITIVE TRACE
PESTICIDES & PCB									
	PROMETONE	4	0	0	3	0	0	8	0
	PROPACINE	4	0	0	3	0	0	8	0
	PROMETRYNE	4	0	0	3	0	0	8	0
	METRIBUZIN	4	0	0	3	0	0	8	0
	SIMAZINE	4	0	0	3	0	0	8	0
	ALACHLOR	4	0	0	3	0	0	8	0
	METOLACHLOR	4	0	0	3	0	0	8	0
*TOTAL SCAN PESTICIDES & PCB		136	0	2	102	0	2	268	0
PHENOLICS									
	PHENOLICS	4	3	1	3	3	0	0	0
*TOTAL SCAN PHENOLICS		4	3	1	3	3	0	0	0
SPECIFIC PESTICIDES									
	TOXAPHENE	0	0	0	0	0	0	0	0
	2,4,5-T	1	0	0	1	0	0	0	0
	2,4-D	1	0	0	1	0	0	0	0
	2,4-DIPHENOLYBUTYRIC	1	0	0	1	0	0	0	0
	2,4-D PROPIONIC ACID	1	0	0	1	0	0	0	0
	DICAMBA	1	0	0	1	0	0	0	0
	PICHLORAM	0	0	0	0	0	0	0	0
	SILVEX	1	0	0	1	0	0	0	0
	DIAZINON	1	0	0	1	0	0	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOCHIND UTP)

SUMMARY TABLE OF RESULTS (1988)

SCAN	PARAMETER	SITE		RAW		TREATED		SITE 1		SITE 3	
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL
SPECIFIC PESTICIDES											
	DICHLOROVOS	1	0	0	1	0	0	.	.	.	.
	CHLORPYRIFOS	1	0	0	1	0	0	.	.	.	.
	ETHION	1	0	0	1	0	0	.	.	.	.
	AZINPHOS-METHYL	0	0	0	0	0	0	.	.	.	.
	NALATHION	1	0	0	0	0	0	.	.	.	.
	MEVINPHOS	1	0	0	1	0	0	.	.	.	.
	METHYL PARATHION	1	0	0	1	0	0	.	.	.	.
	METHYLTRITHION	1	0	0	1	0	0	.	.	.	.
	PARATHION	1	0	0	1	0	0	.	.	.	.
	PHOSPHATE	1	0	0	1	0	0	.	.	.	.
	RELDAN	1	0	0	1	0	0	.	.	.	.
	RONNEL	1	0	0	1	0	0	.	.	.	.
	AMINOCARB	0	0	0	0	0	0	.	.	.	.
	BENOMYL	1	0	0	1	0	0	.	.	.	.
	BUX	1	0	0	1	0	0	.	.	.	.
	CARBOFURAN	1	0	0	1	0	0	.	.	.	.
	CICP	1	0	0	1	0	0	.	.	.	.
	DIALLATE	1	0	0	1	0	0	.	.	.	.
	EPTAM	1	0	0	1	0	0	.	.	.	.
	IPC	1	0	0	1	0	0	.	.	.	.
	PROPOUR	1	0	0	1	0	0	.	.	.	.
	CARBARYL	1	0	0	1	0	0	.	.	.	.
	BUTYLATE	1	0	0	1	0	0	.	.	.	.
TOTAL SCAN SPECIFIC PESTICIDES		26	0	0	28	0	0	0	0	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP)

SUMMARY TABLE OF RESULTS (1988)

SCAM	PARAMETER	SITE			TREATED			SITE 1			SITE 3		
		TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
VOLATILES	BENZENE	4	0	0	3	0	0	0	0	0	0	0	0
	TOLUENE	4	0	2	3	0	1	0	0	1	0	0	0
	ETHYLBENZENE	4	0	2	3	0	1	0	0	5	0	2	0
	P-XYLENE	4	0	0	3	0	0	0	0	0	0	0	0
	M-XYLENE	4	0	0	3	0	0	0	0	1	0	0	0
	O-XYLENE	4	0	0	3	0	0	0	0	0	0	0	0
	STYRENE	3	2	1	3	1	2	3	0	3	3	0	3
	1,1 DICHLOROETHYLENE	4	0	0	3	0	0	0	0	0	0	0	0
	METHYLENE CHLORIDE	4	0	0	3	0	0	0	0	0	0	0	0
	1,1,2,2TETRACHLOROETHYLENE	4	0	0	3	0	0	0	0	0	0	0	0
	1,1 DICHLOROETHANE	4	0	0	3	0	0	0	0	0	0	0	0
	CHLOROFORM	4	0	0	3	3	0	0	0	0	0	0	0
	111, TRICHLOROETHANE	4	0	0	3	0	0	0	0	0	0	0	0
	1,2 DICHLOROETHANE	4	0	0	3	0	0	0	0	0	0	0	0
	CARBON TETRACHLORIDE	4	0	0	3	0	0	0	0	0	0	0	0
	1,2 DICHLOROPROPANE	4	0	0	3	0	0	0	0	0	0	0	0
	TRICHLOROETHYLENE	4	0	0	3	0	0	0	0	0	0	0	0
	DICHLOROBROMOMETHANE	4	0	0	3	3	0	0	0	0	0	0	0
	112 TRICHLOROETHANE	4	0	0	3	0	0	0	0	0	0	0	0
	CHLORODIBROMOMETHANE	4	0	0	3	0	0	0	0	1	0	1	0
	1-CHLOROETHYLENE	4	0	0	3	0	2	7	0	3	7	0	2
	BROMOFORM	4	0	0	3	0	0	0	0	0	0	0	0
	1122 1-CHLOROETHANE	4	0	0	3	0	0	0	0	0	0	0	0
	CHLOROBENZENE	4	0	0	3	0	0	0	0	0	0	0	0
	1,4 DICHLOROBENZENE	4	0	0	3	0	0	0	0	0	0	0	0

TABLE 4

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOCHIND VTP)

SUMMARY TABLE OF RESULTS (1988)

SCAM	PARAMETER	SITE		TREATED		SITE 1		SITE 3	
		TOTAL	POSITIVE TRACE	TOTAL	POSITIVE TRACE	TOTAL	POSITIVE TRACE	TOTAL	POSITIVE TRACE
VOLATILES	1,3 DICHLOROBENZENE	4	0	0	3	0	0	8	0
	1,2 DICHLOROBENZENE	4	0	0	3	0	0	8	0
	TRIFLUOROCHLOROTOLUENE	4	0	0	3	0	0	8	0
	ETHYLENE DIBROMIDE	4	0	0	3	0	0	8	0
	TOTAL TRINITALOMETHANES	4	0	0	3	0	0	8	0
*TOTAL SCAM VOLATILES		115	2	5	87	10	6	228	24
*TOTAL GROUP ORGANIC		413	5	8	319	14	8	608	24
TOTAL		609	102	72	473	101	51	1214	482

KEY TO TABLE 5 and 6

- A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
 - 1+. MAC for Total Trihalomethanes
 - 1*. MAC for Bacteriological Analyses
- Poor water quality is indicated when :
- total coliform counts $> 0 < 5$
 - P/A Bottle Test is present after 48 hours
 - Aeromonas organisms are detected in more than 25% of samples in a single submission or in successive submissions from the same sampling site
 - Pseudomonas Aeruginosa, Staphylococcus Aureus and members of the Fecal Streptococcus group should not be detected in any sample
 - Standard Plate Count should not exceed 500 organisms per ml at 35 °C within 48 hours
2. Interim Maximum Acceptable Concentration (IMAC)
 3. Maximum Desirable Concentration (MDC)
 4. Aesthetic or Recommended Operational Guideline
- hardness levels between 80 and 100 mg/L as calcium carbonate are considered to provide an acceptable balance between corrosion and incrustation, water supplies with a hardness > 200 mg/L are considered poor and those in excess of 500 mg/L are unacceptable.
- B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
 2. Proposed MAC
 3. Interim MAC
 4. Aesthetic Objective (AO) (for xylenes, the AO is a total)
- C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
 2. Tentative GV
 3. Aesthetic GV
- D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
 2. Suggested No-Adverse Effect Level (SNAEL)
 3. Lifetime Health Advisory
 4. EPA Ambient Water Quality Criteria
- F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
 2. Aesthetic Guideline Level
 3. Maximum Admissible Concentration (MADC)
- G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE
- H USSR MAXIMUM PERMISSIBLE CONCENTRATION
- I NEW YORK STATE AMBIENT WATER GUIDELINE
- N/A NONE AVAILABLE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurable Amount
<T	Greater Than Detection Limit But Not Confident
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!AW	No Data: Analysis Withdrawn
!CR	No Data: Could Not Confirm By Reanalysis
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample

RMP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant
UAL	Unreliable: Sample Age Exceeds Normal Limit
UCR	Unreliable: Could Not Confirm By Reanalysis
UCS	Unreliable: Contamination Suspected
UIN	Unreliable: Indeterminant Interference
XP	Positive After X Number of Hours

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP) 1988

WATER TREATMENT PLANT			DISTRIBUTION SYSTEM			
RAW	TREATED	SITE 1	SITE 3			
		STANDING	FREE FLOW	STANDING	FREE FLOW	
BACTERIOLOGICAL						
FECAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = 0 (A1)		
SEP	0 T48	.	.	.	.	.
OCT	0 T48	.	.	.	.	.
NOV	BDL	.	.	.	.	.
FECAL COLIFORM (0=ABSENT)		DET'N LIMIT = N/A		GUIDELINE = 0 (A1)		
NOV	.	0	.	0	.	0
STANDRD PLATE CNT MF (CT/ML)		DET'N LIMIT = 0		GUIDELINE = 500/ML (A1)		
MAY	.	.	.	42	.	3
JUN	.	.	.	1	.	1
JUL	.	.	.	17	.	0
AUG	.	.	.	6	.	3
SEP	.	.	.	1 <=>	.	1 <=>
OCT	.	6 <=>	.	2 <=>	.	0 <=>
NOV	.	1	.	1	.	0
P/A BOTTLE (0=ABSENT)		DET'N LIMIT = 0		GUIDELINE = 0 (A1*)		
MAY	.	.	.	0	.	0
JUN	.	.	.	0	.	0
JUL	.	.	.	0	.	0
AUG	.	.	.	0	.	0
COLIFORM (0=ABSENT)		DET'N LIMIT = N/A		GUIDELINE = 0 (A1)		
NOV	.	0	.	0	.	0
TOTAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = 5/100ML(A1)		
MAY	.	.	.	0	.	0
JUN	.	.	.	0	.	0
JUL	.	.	.	0	.	0
AUG	.	.	.	0	.	0
SEP	4 <=>	.	.	0 T48	.	0 T48
OCT	18 A3C	0 T48	.	0 T48	.	0
NOV	BDL	0	.	0	.	0
T COLIFORM BCKGRD MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = N/A		
MAY	.	.	.	0	.	0
JUN	.	.	.	0	.	0

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP) 1988

SITE TYPE	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW
JUL	.	.	.	5	.	0
AUG	.	.	.	0	.	0
SEP	4800 >	.	.	0 T48	.	0 T48
OCT	1860 A3C	0 T48	.	0 T48	.	0

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP) 1988

WATER TREATMENT PLANT				DISTRIBUTION SYSTEM			
SITE							
TYPE	RAW	TREATED	SITE 1		SITE 3		
			STANDING	FREE FLOW	STANDING	FREE FLOW	

CHEMISTRY (FLD)							
FLD CHLORINE (COMB) (MG/L)		DET'N LIMIT = N/A		GUIDELINE = N/A			
MAY	.	.	.100	.100	.100	.	.200
JUN	.	.	.	.100	.	.	.200
JUL	.	.	.	.200	.	.	.200
AUG	.	.	.	.300	.	.	.400
SEP	.	.	.	.100	.	.	.400
OCT	.	.280	.	.200	.800	.	.200
NOV	.	.220	.	.300	.	.	.200
DEC	.	.	.	.300	.	.	.400

FLD CHLORINE FREE (MG/L)		DET'N LIMIT = N/A		GUIDELINE = N/A			
MAY	.	.	.100	1.100	.100	.	.700
JUN	.	.	.	.400	.100	.	.500
JUL	.	.	.	.700	.100	.	.700
AUG	.	.	.	.700	.100	.	.500
SEP	.	.	.	.900	.100	.	.300
OCT	.	2.080	.	1.000	.100	.	.900
NOV	.	1.630	.	.700	.100	.	.700
DEC	.	1.900	.	1.000	.100	.	.700

FLD CHLORINE (TOTAL) (MG/L)		DET'N LIMIT = N/A		GUIDELINE = N/A			
MAY	.	.	.100	1.300	.100	.	.900
JUN	.	.	.	.500	.100	.	.700
JUL	.	.	.	.900	.100	.	.900
AUG	.	.	.	1.000	.100	.	.900
SEP	.	.	.	1.000	.100	.	.700
OCT	.	2.380	.	1.200	.900	.	1.100
NOV	.	1.850	.	1.000	.100	.	.900
DEC	.	1.900	.	1.300	.100	.	1.100

FLD PH (DMSNLESS)		DET'N LIMIT = N/A		GUIDELINE = 6.5-8.5(A4)			
MAY	.	.	7.200	7.700	7.200	.	7.600
JUN	.	.	7.400	7.600	7.400	.	7.400
JUL	.	.	.	7.600	7.400	.	7.400
AUG	.	.	7.600	7.700	7.400	.	7.400
SEP	7.100	.	.	7.700	7.400	.	7.600
OCT	7.200	8.200	7.400	7.700	7.500	.	7.600
NOV	7.000	8.400	.	.	7.400	.	7.800
DEC	7.100	7.900	.	7.700	7.400	.	7.500

FLD TEMPERATURE (DEG.C)		DET'N LIMIT = N/A		GUIDELINE = 15 (A1)			

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP) 1988

SITE TYPE	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW
MAY	.	.	15.000	8.000	20.000	3.500
JUN	.	.	13.000	9.500	24.000	11.000
JUL	.	.	.	12.000	23.000	14.000
AUG	.	.	21.200	13.700	25.000	11.500
SEP	14.000	.	.	.	22.000	13.000
OCT	9.000	9.000	17.000	.	15.000	13.000
NOV	5.000	5.000	.	.	19.000	9.000
DEC	4.000	4.000	.	.	19.000	10.000
FLD TURBIDITY (FTU)	)		DET'N LIMIT = N/A		GUIDELINE = 1.0 (A1)	
SEP	.800	.	.	.	.	.
OCT	.950	.950	.	.	.	.
NOV	.480	.	.	.	.	.

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP) 1988

WATER TREATMENT PLANT				DISTRIBUTION SYSTEM		
SITE						
TYPE	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW

CHEMISTRY (LAB)						
ALKALINITY (MG/L)			DET'N LIMIT = .200		GUIDELINE = 30-500 (A4)	
MAY	.	.	24.600	23.800	24.200	26.900
JUN	.	.	27.500	23.400	22.800	21.700
JUL	.	.	.	22.100	21.900	20.800
AUG	.	.	26.500	24.700	25.500	24.200
SEP	21.600	.	.	24.900	24.500	23.600
OCT	23.200	23.100	25.500	23.700	23.000	23.000
NOV	22.200	24.800	26.000	25.200	25.700	24.700
DEC	22.100	24.100	.	24.700	25.100	24.000

CALCIUM (MG/L)			DET'N LIMIT = .100		GUIDELINE = 100 (F2)	
MAY	.	.	6.200	5.600	6.200	5.800
JUN	.	.	7.200	6.800	7.400	6.600
JUL	.	.	.	6.100	6.400	6.400
AUG	.	.	7.000	6.200	6.600	6.200
SEP	6.200	.	.	6.400	6.800	6.400
OCT	6.400	6.400	7.000	6.200	6.400	6.200
NOV	7.400	7.000	7.000	6.400	7.000	6.800
DEC	6.200	6.400	.	6.000	6.400	6.200

CHLORIDE (MG/L)			DET'N LIMIT = .200		GUIDELINE = 250 (A3)	
MAY	.	.	3.200	3.000	3.100	2.900
JUN	.	.	3.500	3.000	3.200	3.000
JUL	.	.	.	3.400	3.600	3.300
AUG	.	.	3.600	3.300	3.500	3.200
SEP	.100	.	.	2.900	3.300	2.900
OCT	BDL	2.700	3.000	2.600	2.700	2.600
NOV	.600 <T	2.900	3.100	3.000	3.200	3.100
DEC	1.200	2.900	.	3.000	3.600	3.000

COLOUR (TCU)			DET'N LIMIT = .5		GUIDELINE = 5.0 (A3)	
MAY	.	.	7.500	7.500	8.500	8.000
JUN	.	.	11.000	8.500	7.500	8.000
JUL	.	.	.	8.500	8.500	9.000
AUG	.	.	10.000	7.000	7.000	6.500
SEP	10.000	.	.	6.500	6.500	6.500
OCT	11.000	6.000	7.000	6.500	6.500	6.000
NOV	11.500	6.500	9.500	7.500	8.000	7.500
DEC	12.000	6.500	.	7.000	8.000	8.000

CONDUCTIVITY (UMHO/CM)			DET'N LIMIT = 1		GUIDELINE = 400 (F2)	

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCK LOMOND WTP) 1988

SITE TYPE	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW
MAY	.	.	73	71	83	77
JUN	.	.	76	73	72	69
JUL	.	.	.	72	75	71
AUG	.	.	79	74	79	74
SEP	57	.	.	74	77	72
OCT	61	72	74	72	75	71
NOV	61	74	77	75	79	75
DEC	59	72	.	73	76	72

FLUORIDE (MG/L)						
			DET'M LIMIT = .01		GUIDELINE = 2.400 (A1)	
MAY	.	.	.020 <T	.010 <T	.020 <T	.020 <T
JUN	.	.	.020 <T	.020 <T	.020 <T	.020 <T
JUL	.	.	.	.020 <T	.020 <T	.020 <T
AUG	.	.	.020 <T	.030 <T	.030 <T	.020 <T
SEP	.040	.	.	.040	.020	.040
OCT	.020 <T	.040 <T	.040 <T	.040 <T	.040 <T	.040 <T
NOV	.040 <T	.020 <T	.020 <T	.020 <T	.020 <T	.020 <T
DEC	.020 <T	.020 <T	.	.020 <T	.020 <T	.020 <T

HARDNESS (MG/L)						
			DET'M LIMIT = .500		GUIDELINE = 80-100 (A4)	
MAY	.	.	24.000	22.000	24.000	23.000
JUN	.	.	27.000	27.000	28.000	27.000
JUL	.	.	.	26.800	27.900	27.900
AUG	.	.	29.000	26.000	27.000	27.000
SEP	27.000	.	.	26.000	28.000	27.000
OCT	27.000	27.000	29.000	26.000	27.000	26.000
NOV	28.000	28.000	28.000	27.000	27.000	27.000
DEC	26.000	26.000	.	25.000	26.000	25.000

TOTAL CAL (DMS/LESS)						
			DET'M LIMIT = N/A		GUIDELINE = N/A	
MAY	.	.	.000 NAF	.000 NAF	.000 NAF	.000 NAF
JUN	.	.	.000 NAF	.000 NAF	.000 NAF	.000 NAF
JUL	.	.	.	7.224	6.829	12.820
AUG	.	.	4.634	5.327	.676	3.362
SEP	1.523	.	.	4.276	4.019	5.027
OCT	2.205	9.093	7.158	1.420	7.762	6.134
NOV	6.413	3.165	.055	.259	.433	2.448
DEC	6.090	.707	.	2.199	3.509	3.775

LANGLIERS INDEX (DMS/LESS)						
			DET'M LIMIT = N/A		GUIDELINE = N/A	
MAY	.	.	1.472 NAF	1.500 NAF	1.484 NAF	1.164 NAF

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCK LOWMOO WTP) 1988

SITE TYPE	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW
JUN	.	.	-1.370 HAF	-1.463 HAF	-1.488 HAF	-1.577 HAF
JUL	.	.	.	-1.545	-1.629	-1.590
AUG	.	.	-1.430	-1.511	-1.492	-1.529
SEP	-1.531	.	.	-1.373	-1.435	-1.426
OCT	-1.538	-1.555	-1.464	-1.498	-1.598	-1.580
NOV	-1.414	-1.186	-1.127	-1.139	-1.273	-1.331
DEC	-1.572	-1.377	.	-1.334	-1.401	-1.432
MAGNESIUM (MG/L)						
			DET'N LIMIT = .050		GUIDELINE = 30 (F2)	
MAY	.	.	2.000	2.000	2.100	2.100
JUN	.	.	2.300	2.300	2.300	2.400
JUL	.	.	.	2.800	2.900	2.900
AUG	.	.	2.800	2.700	2.700	2.700
SEP	2.600	.	.	2.600	2.700	2.700
OCT	2.600	2.700	2.800	2.500	2.700	2.600
NOV	2.500	2.500	2.500	2.500	2.500	2.500
DEC	2.500	2.400	.	2.400	2.500	2.400
SODIUM (MG/L)						
			DET'N LIMIT = .200		GUIDELINE = 200 (C3)	
MAY	.	.	3.600	3.800	3.200	3.000
JUN	.	.	3.600	3.800	3.200	3.000
JUL	.	.	.	4.200	3.800	3.800
AUG	.	.	4.800	5.000	4.400	4.400
SEP	1.000 <T	.	.	4.600	4.000	4.000
OCT	.800 <T	4.000	4.200	3.600	3.800	3.800
NOV	1.000 <T	3.800	4.000	4.200	4.000	4.000
DEC	1.200	4.000	.	4.400	4.000	3.800
AMMONIUM TOTAL (MG/L)						
			DET'N LIMIT = 0.002		GUIDELINE = .05 (F2)	
MAY	.	.	.030	.026	.022	.024
JUN	.	.	.018	.012	.052	.010
JUL	.	.	.	.006 <T	.066	.006 <T
AUG	.	.	.006 <T	.006 <T	.148	.006 <T
SEP	.012	.	.	.012	.214	.010
OCT	.008	.012	.008	.010	.346	.014
NOV	.006 <T	.008 <T	.008 <T	.002 <T	.156	.010
DEC	.008 <T	.012	.	.010	.158	.014
NITRITE (MG/L)						
			DET'N LIMIT = 0.001		GUIDELINE = 1.000 (A1)	
MAY	.	.	.003 <T	.003 <T	.003 <T	.006 <T
JUN	.	.	.005	.002 <T	.002 <T	.003 <T

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCK LONING WTP) 1988

SITE TYPE	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW
JUL	.	.	.	.002 <T	.002 <T	.002 <T
AUG	.	.	.008	.004 <T	.006	.007
SEP	.006	.	.	.007	.008	.006
OCT	.006	.003	.003	.005	.009	.005
NOV	.001 <T	.001 <T	.002 <T	.001 <T	.002 <T	.001 <T
DEC	.002 <T	.002 <T	.	.002 <T	.002 <T	.002 <T
TOTAL NITRATES (MG/L) DET'M LIMIT = .020 GUIDELINE = 10.000 (A1)						
MAY	.	.	.090 <T	.065 <T	.085 <T	.065 <T
JUN	.	.	.070 <T	.055 <T	.135	.055 <T
JUL	.	.	.	.80L	.120	.80L
AUG	.	.	.030 <T	.030 <T	.225	.025 <T
SEP	.020 <T	.	.	.025 <T	.230	.035 <T
OCT	.035	.030	.035	.030	.405	.030
NOV	.085 <T	.085 <T	.095 <T	.085 <T	.250	.090 <T
DEC	.070 <T	.070 <T	.	.075 <T	.240	.090 <T
NITROGEN TOT KJELD (MG/L) DET'M LIMIT = .020 GUIDELINE = N/A						
MAY	.	.	.230	.210	.220	.210
JUN	.	.	.300	.260	.320	.310
JUL	.	.	.	.530	.420	.300
AUG	.	.	.320	.270	.470	.320
SEP	.240	.	.	.250	.360	.230
OCT	.240	.240	.240	.230	.580	.210
NOV	.220	.220	.220	.220	.370	.220
DEC	.240	.240	.	.220	.390	.240
PH (DIMLESS) DET'M LIMIT = N/A GUIDELINE = 6.5-8.5(A4)						
MAY	.	.	7.690	7.720	7.690	7.990
JUN	.	.	7.680	7.680	7.630	7.610
JUL	.	.	.	7.670	7.570	7.630
AUG	.	.	7.650	7.650	7.630	7.640
SEP	7.680	.	.	7.770	7.690	7.740
OCT	7.630	7.620	7.630	7.680	7.580	7.610
NOV	7.710	7.920	7.960	8.000	7.820	7.790
DEC	7.630	7.780	.	7.840	7.740	7.740
PHOSPHORUS FIL REACT (MG/L) DET'M LIMIT = .0005 GUIDELINE = N/A						
SEP	.001 <T	.	.	.	.	.
OCT	.000	.002	.	.	.	.
NOV	.000 <T	.001 <T	.	.	.	.

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP) 1968

SITE TYPE	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW
DEC	.001 <T	.001 <T	.	.	.	.
PHOSPHORUS TOTAL (MG/L)	DET'M LIMIT = .002		GUIDELINE = .40 (F2)			
SEP	.004 <T	.	.	.	.	.
OCT	.006 <T	.011	.	.	.	.
NOV	.004 <T	.005 <T	.	.	.	.
DEC	.005 <T	.005 <T	.	.	.	.
SULPHATE (MG/L)	DET'M LIMIT = .200		GUIDELINE = 500. (A3)			
JUL	.	.	.	6.320	6.400	6.350
AUG	.	.	5.780	5.870	5.940	5.940
SEP	5.900	.	.	5.880	5.870	6.030
OCT	5.510	5.590	5.520	5.450	5.460	5.490
NOV	5.500	5.500	5.500	5.500	5.500	5.500
DEC	5.840	6.130	.	5.760	5.500	6.120
TURBIDITY (FTU)	DET'M LIMIT = .02		GUIDELINE = 1.00 (A1)			
MAY	.	.	.410	.280	.250	.220
JUN	.	.	6.200	.460	.630	.370
JUL	.	.	.	.200	.970	1.100
AUG	.	.	1.290	1.000	.800	1.100
SEP	.870	.	.	.760	.850	.650
OCT	.900	.980	.880	.620	.840	.960
NOV	.380	.460	.630	.540	.610	.500
DEC	.500	.440	.	.510	.610	.590

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP) 1988

WATER TREATMENT PLANT				DISTRIBUTION SYSTEM			
SITE TYPE	RAW	TREATED	SITE 1		SITE 3		
			STANDING	FREE FLOW	STANDING	FREE FLOW	
METALS							
SILVER (UG/L)			DET'N LIMIT = .020		GUIDELINE = 50. (A1)		
MAY	.	.	.030 <T	.040 <T	.040 <T	BOL	
JUN	.	.	.110 <T	BOL	.050 <T	.030 <T	
JUL	.	.	.	BOL	.030 <T	BOL	
AUG	.	.	BOL	.040 <T	.030 <T	.030 <T	
SEP	BOL	.	.	BOL	BOL	.080 <T	
OCT	BOL	BOL	BOL	.040 <T	.040 <T	BOL	
NOV	BOL	.040 <T	.140 <T	.060 <T	.060 <T	.050 <T	
DEC	BOL	BOL	.	BOL	BOL	.090 <T	
ALUMINUM (UG/L)			DET'N LIMIT = .050		GUIDELINE = 100. (A4)		
MAY	.	.	6.100	10.000	11.000	11.000	
JUN	.	.	32.000	14.000	18.000	11.000	
JUL	.	.	.	14.000	19.000	11.000	
AUG	.	.	18.000	26.000	25.000	24.000	
SEP	7.200	.	.	13.000	20.000	11.000	
OCT	6.000	14.000	8.900	10.000	16.000	10.000	
NOV	8.900	18.000	15.000	17.000	18.000	16.000	
DEC	3.800	12.000	.	15.000	14.000	14.000	
ARSENIC (UG/L)			DET'N LIMIT = 0.050		GUIDELINE = 50.0 (A1)		
MAY	.	.	BOL	BOL	.260 <T	.200 <T	
JUN	.	.	.580 <T	.410 <T	.390 <T	.350 <T	
JUL	.	.	.	.440 <T	.380 <T	.470 <T	
AUG	.	.	.160 <T	.310 <T	.350 <T	.210 <T	
SEP	.330 <T	.	.	.210 <T	.290 <T	.260 <T	
OCT	.370 <T	.220 <T	.400 <T	.250 <T	.180 <T	.300 <T	
NOV	.380 <T	.350 <T	.320 <T	.220 <T	.250 <T	.240 <T	
DEC	.280 <T	.320 <T	.	.290 <T	.380 <T	.400 <T	
BARIUM (UG/L)			DET'N LIMIT = 0.020		GUIDELINE = 1000. (A1)		
MAY	.	.	6.400	4.900	7.500	5.200	
JUN	.	.	12.000	5.600	7.500	5.500	
JUL	.	.	.	5.600	6.800	5.800	
AUG	.	.	6.200	5.200	7.300	5.500	
SEP	4.900	.	.	4.400	6.000	4.800	
OCT	4.900	5.700	5.800	4.900	5.200	4.900	
NOV	5.200	5.400	5.000	4.300	6.100	4.900	
DEC	4.600	5.100	.	4.500	6.700	5.400	
BORON (UG/L)			DET'N LIMIT = 0.200		GUIDELINE = 5000. (A1)		

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCK LOWMOO WTP) 1988

SITE TYPE	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW
MAY	.	.	11.000 <T	5.500 <T	6.300 <T	4.200 <T
JUN	.	.	8.900 <T	6.600 <T	7.600 <T	6.100 <T
JUL	.	.	.	6.600 <T	190.000	7.100 <T
AUG	.	.	25.000	15.000 <T	27.000	6.900 <T
SEP	12.000 <T	.	.	6.400 <T	18.000 <T	9.900 <T
OCT	7.800 <T	8.500 <T	8.600 <T	6.900 <T	56.000	7.600 <T
NOV	21.000	20.000 <T	19.000 <T	21.000	10.000 <T	6.700 <T
DEC	12.000 <T	11.000 <T	.	9.100 <T	19.000 <T	10.000 <T
BERYLLIUM (UG/L)						
			DET'N LIMIT = 0.010		GUIDELINE = .20 (H)	
MAY	.	.	.020 <T	BDL	BDL	BDL
JUN	.	.	BDL	BDL	BDL	BDL
JUL	.	.	.	BDL	BDL	BDL
AUG	.	.	BDL	.040 <T	.030 <T	BDL
SEP	.100 <T	.	.	.050 <T	.040 <T	BDL
OCT	BDL	BDL	BDL	BDL	.030 <T	.020 <T
NOV	BDL	BDL	.100 <T	.050 <T	.080 <T	.040 <T
DEC	.070 <T	.040 <T	.	.110 <T	.050 <T	.060 <T
CADMIUM (UG/L)						
			DET'N LIMIT = 0.050		GUIDELINE = 5.000 (A1)	
MAY	.	.	.060 <T	BDL	BDL	BDL
JUN	.	.	1.300	BDL	BDL	BDL
JUL	.	.	.	BDL	BDL	BDL
AUG	.	.	.110 <T	BDL	BDL	BDL
SEP	BDL	.	.	BDL	BDL	BDL
OCT	BDL	BDL	.070 <T	BDL	BDL	BDL
NOV	BDL	BDL	.070 <T	BDL	BDL	BDL
DEC	BDL	BDL	.	BDL	BDL	BDL
COBALT (UG/L)						
			DET'N LIMIT = 0.020		GUIDELINE = 1000 (H)	
MAY	.	.	.030 <T	.040 <T	.050 <T	.030 <T
JUN	.	.	.120 <T	.070 <T	.080 <T	.060 <T
JUL	.	.	.	BDL	.030 <T	BDL
AUG	.	.	.040 <T	.080 <T	.100 <T	.080 <T
SEP	.080 <T	.	.	.100 <T	.120 <T	.070 <T
OCT	.060 <T	.070 <T	.350 <T	.090 <T	.100 <T	.080 <T
NOV	.070 <T	.060 <T	.080 <T	.050 <T	.210 <T	.060 <T
DEC	BDL	.050 <T	.	.090 <T	.110 <T	.100 <T
CHROMIUM (UG/L)						
			DET'N LIMIT = 0.100		GUIDELINE = 50. (A1)	
MAY	.	.	.410 <T	1.400	BDL	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP) 1988

SITE TYPE	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW
JUN	.	.	.160 <T	BDL	BDL	BDL
JUL	.	.	.	BDL	BDL	BDL
AUG	.	.	.530 <T	.730 <T	.760 <T	.190 <T
SEP	1.400	.	.	.270 <T	.210 <T	.260 <T
OCT	5.100	1.100	1.200	.520 <T	1.300	BDL
NOV	1.200	1.100	1.100	1.500	BDL	BDL
DEC	.710 <T	.400 <T	.	.200 <T	.750 <T	.160 <T
COPPER (UG/L)						
			DET'N LIMIT = .100		GUIDELINE = 1000 (A3)	
MAY	.	.	240.000	17.000	420.000	44.000
JUN	.	.	480.000	29.000	410.000	91.000
JUL	.	.	.	30.000	340.000	160.000
AUG	.	.	220.000	21.000	370.000	50.000
SEP	2.000	.	.	15.000	220.000	47.000
OCT	3.200	7.400	210.000	19.000	120.000	49.000
NOV	1.800	2.200	120.000	11.000	230.000	47.000
DEC	1.600	1.700	.	8.700	220.000	50.000
IRON (UG/L)						
			DET'N LIMIT = 4.000		GUIDELINE = 300. (A3)	
MAY	.	.	11.000 <T	25.000 <T	20.000 <T	26.000 <T
JUN	.	.	370.000	41.000 <T	20.000 <T	22.000 <T
JUL	.	.	.	46.000 <T	27.000 <T	23.000 <T
AUG	.	.	57.000	30.000 <T	19.000 <T	22.000 <T
SEP	32.000 <T	.	.	48.000 <T	29.000 <T	25.000 <T
OCT	23.000 <T	25.000 <T	22.000 <T	29.000 <T	24.000 <T	20.000 <T
NOV	27.000 <T	33.000 <T	110.000	48.000 <T	31.000 <T	34.000 <T
DEC	13.000 <T	14.000 <T	.	35.000 <T	19.000 <T	28.000 <T
MERCURY (UG/L)						
			DET'N LIMIT = 0.010		GUIDELINE = 1.000 (A1)	
MAY	.	.	.	BDL	.	BDL
JUN	.	.	.	BDL	.	BDL
JUL	.	.	.	.050 <T	.	.050 <T
AUG	.	.	.	.050 <T	.	BDL
SEP	.020 <T	.	.	.040 <T	.	BDL
OCT	.020 <T	.090	.	.050 <T	.	BDL
NOV	.030 <T	.040 <T	.	.060	.	BDL
DEC	BDL	BDL	.	.050 <T	.	BDL
MANGANESE (UG/L)						
			DET'N LIMIT = .050		GUIDELINE = 50.0 (A3)	
MAY	.	.	1.400	1.600	2.900	1.700
JUN	.	.	18.000	3.100	3.600	2.200

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP) 1988

SITE TYPE	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW
JUL	.	.	.	3.200	4.300	2.600
AUG	.	.	2.200	3.300	4.100	2.500
SEP	2.600	.	.	4.400	3.600	2.500
OCT	3.200	3.800	3.100	2.800	3.400	2.500
NOV	3.300	3.300	3.300	3.500	3.100	2.800
DEC	.080 <T	1.200	.	2.700	3.000	2.600
MOLYBDENUM (UG/L)		DET'N LIMIT = 0.020		GUIDELINE = 500 (N)		
MAY	.	.	.160 <T	.140 <T	.290 <T	.140 <T
JUN	.	.	.180 <T	.160 <T	.180 <T	.170 <T
JUL	.	.	.	.170 <T	.130 <T	.140 <T
AUG	.	.	.140 <T	.150 <T	.160 <T	.120 <T
SEP	.110 <T	.	.	.140 <T	.170 <T	.140 <T
OCT	.070 <T	.150 <T	.100 <T	.110 <T	.120 <T	.130 <T
NOV	.090 <T	.090 <T	.110 <T	.080 <T	.100 <T	.100 <T
DEC	.090 <T	.140 <T	.	.110 <T	.100 <T	.170 <T
NICKEL (UG/L)		DET'N LIMIT = 0.100		GUIDELINE = 50. (F3)		
MAY	.	.	3.700	BDL	1.000 <T	.240 <T
JUN	.	.	1.300 <T	.680 <T	3.700	.760 <T
JUL	.	.	.	.810 <T	3.800	.990 <T
AUG	.	.	.210 <T	.280 <T	2.900	.640 <T
SEP	.260 <T	.	.	.250 <T	9.400	.760 <T
OCT	.410 <T	16.000	.500 <T	.430 <T	4.000	1.200 <T
NOV	.330 <T	.230 <T	BDL	BDL	17.000	.170 <T
DEC	.280 <T	.360 <T	.	.340 <T	13.000	.400 <T
LEAD (UG/L)		DET'N LIMIT = 0.050		GUIDELINE = 50. (A1)		
MAY	.	.	57.000	11.000	3.800	1.000
JUN	.	.	580.000	21.000	4.800	.890
JUL	.	.	.	17.000	3.700	1.200
AUG	.	.	46.000	14.000	4.300	.840
SEP	.050 <T	.	.	8.600	3.500	.910
OCT	.200 <T	.610	64.000	8.500	3.500	.660
NOV	.260	.200 <T	45.000	4.900	3.200	.630
DEC	.030 <T	.040 <T	.	3.400	3.000	.600
ANTIMONY (UG/L)		DET'N LIMIT = .050		GUIDELINE = 146. (D4)		
MAY	.	.	.130 <T	.060 <T	.110 <T	.070 <T
JUN	.	.	.490	.070 <T	.110 <T	.070 <T
JUL	.	.	.	.070 <T	.060 <T	.050 <T

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP) 1988

SITE TYPE	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW
AUG	.	.	.660	.480	.690	.460
SEP	.500	.	.	.430	.460	.300
OCT	.430	.470	.960	.480	.450	.450
NOV	.390	.400	.480	.440	.520	.440
DEC	.130 <T	.150 <T	.	.220	.240	.290
SELENIUM (UG/L)						
			DET'N LIMIT = 0.200		GUIDELINE = 10. (A1)	
MAY	.	.	BDL	BDL	BDL	BDL
JUN	.	.	BDL	BDL	BDL	BDL
JUL	.	.	.	2.000 <T	1.400 <T	2.200 <T
AUG	.	.	BDL	BDL	BDL	BDL
SEP	BDL	.	.	.700 <T	2.300 <T	BDL
OCT	1.100 <T	.510 <T	2.000 <T	1.700 <T	.340 <T	BDL
NOV	BDL	1.000 <T	BDL	.600 <T	BDL	.680 <T
DEC	BDL	BDL	.	.380 <T	BDL	1.700 <T
STRONTIUM (UG/L)						
			DET'N LIMIT = .050		GUIDELINE = 2000. (H)	
MAY	.	.	16.000	14.000	17.000	15.000
JUN	.	.	17.000	14.000	16.000	15.000
JUL	.	.	.	14.000	15.000	15.000
AUG	.	.	15.000	14.000	15.000	13.000
SEP	15.000	.	.	15.000	16.000	15.000
OCT	15.000	15.000	15.000	15.000	15.000	15.000
NOV	14.000	15.000	16.000	15.000	16.000	15.000
DEC	12.000	14.000	.	13.000	16.000	15.000
TITANIUM (UG/L)						
			DET'N LIMIT = .050		GUIDELINE = N/A	
MAY	.	.	9.700	11.000	9.900	8.800
JUN	.	.	9.400	8.800	7.500	7.100
JUL	.	.	.	10.000	7.900	7.800
AUG	.	.	12.000	12.000	12.000	12.000
SEP	.820 <T	.	.	8.500	5.500	6.000
OCT	2.500	12.000	12.000	12.000	12.000	11.000
NOV	4.000	17.000	18.000	19.000	17.000	18.000
DEC	2.100	7.700	.	8.600	7.900	8.500
THALLIUM (UG/L)						
			DET'N LIMIT = .010		GUIDELINE = 13. (D4)	
MAY	.	.	BDL	BDL	BDL	BDL
JUN	.	.	.230	.030 <T	BDL	BDL
JUL	.	.	.	BDL	BDL	BDL
AUG	.	.	.020 <T	BDL	BDL	BDL

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP) 1988

SITE TYPE	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SEP	BDL	.	.	BDL	.030 <T	BDL
OCT	BDL	BDL	.020 <T	BDL	BDL	BDL
NOV	BDL	BDL	BDL	.020 <T	BDL	BDL
DEC	BDL	BDL	.	BDL	BDL	.030 <T
URANIUM (UG/L)		DET'N LIMIT = .020		GUIDELINE = 20. (A2)		
MAY	.	.	BDL	BDL	.030 <T	BDL
JUN	.	.	.040 <T	.030 <T	.030 <T	BDL
JUL	.	.	.	BDL	BDL	BDL
AUG	.	.	BDL	BDL	BDL	BDL
SEP	BDL	.	.	.080 <T	.040 <T	.050 <T
OCT	BDL	BDL	BDL	BDL	BDL	BDL
NOV	BDL	BDL	.050 <T	.050 <T	.030 <T	BDL
DEC	BDL	BDL	.	BDL	BDL	.090 <T
VANADIUM (UG/L)		DET'N LIMIT = .050		GUIDELINE = 100 (N)		
MAY	.	.	.080 <T	.150 <T	.150 <T	.140 <T
JUN	.	.	1.200	.130 <T	.150 <T	.120 <T
JUL	.	.	.	.160 <T	.160 <T	.140 <T
AUG	.	.	.120 <T	.150 <T	.200 <T	.160 <T
SEP	.220 <T	.	.	.200 <T	.190 <T	.210 <T
OCT	.210 <T	.210 <T	.190 <T	.180 <T	.210 <T	.220 <T
NOV	.190 <T	.190 <T	.180 <T	.200 <T	.200 <T	.180 <T
DEC	.130 <T	.190 <T	.	.180 <T	.180 <T	.200 <T
ZINC (UG/L)		DET'N LIMIT = .001		GUIDELINE = 5.00 (A3)		
MAY	.	.	27.000	1.200	55.000	7.300
JUN	.	.	61.000	6.100	36.000	7.100
JUL	.	.	.	7.400	27.000	8.000
AUG	.	.	24.000	3.500	22.000	5.400
SEP	.200 <T	.	.	.960 <T	30.000	10.000
OCT	.590 <T	2.800	15.000	1.100	62.000	10.000
NOV	.400 <T	.360 <T	17.000	1.500	17.000	4.800
DEC	.270 <T	.210 <T	.	.880 <T	29.000	6.100

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP) 1988

WATER TREATMENT PLANT			DISTRIBUTION SYSTEM			
SITE			SITE 1		SITE 3	
TYPE	RAW	TREATED				
			STANDING	FREE FLOW	STANDING	FREE FLOW

CHLOROPHENOLS						
246-TRICHLOROPHENOL (NG/L)			DET'N LIMIT = 50.		GUIDELINE = 5000 (B1)	
NOV	BDL	210.000	.	.	.	.

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP) 1988

WATER TREATMENT PLANT				DISTRIBUTION SYSTEM			
SITE TYPE	RAW	TREATED	SITE 1		SITE 3		
			STANDING	FREE FLOW	STANDING	FREE FLOW	
PESTICIDES & PCB							
ALPHA BHC (NG/L)			DET'N LIMIT = 1.000		GUIDELINE = 700 (G)		
MAY	.	.	.	3.000 <T	.	2.000 <T	
JUN	.	.	.	2.000 <T	.	1.000 <T	
JUL	.	.	.	BDL	.	4.000 <T	
AUG	.	.	.	2.000 <T	.	2.000 <T	
SEP	BDL	.	.	BDL	.	2.000 <T	
OCT	BDL	3.000 <T	.	BDL	.	2.000 <T	
NOV	2.000 <T	BDL	.	2.000 <T	.	2.000 <T	
DEC	2.000 <T	2.000 <T	.	2.000 <T	.	2.000 <T	
LINDANE (NG/L)							
			DET'N LIMIT = 1.000		GUIDELINE = 4000 (A1)		
MAY	.	.	.	BDL	.	BDL	
JUN	.	.	.	BDL	.	BDL	
JUL	.	.	.	BDL	.	2.000 <T	
AUG	.	.	.	BDL	.	BDL	
SEP	BDL	.	.	BDL	.	BDL	
OCT	BDL	BDL	.	BDL	.	BDL	
NOV	BDL	BDL	.	BDL	.	BDL	
DEC	BDL	BDL	.	BDL	.	BDL	

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP) 1988

WATER TREATMENT PLANT			DISTRIBUTION SYSTEM			
SITE TYPE	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW

PHENOLICS						
PHENOLICS (UG/L)		DET'N LIMIT = 0.2		GUIDELINE = 2.00 (A3)		
SEP	.600 <T	.	.	.	.	.
OCT	1.800	2.400	.	.	.	.
NOV	2.000	2.600	.	.	.	.
DEC	2.000	1.000	.	.	.	.

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCH LOMOND WTP) 1988

WATER TREATMENT PLANT				DISTRIBUTION SYSTEM		
SITE TYPE	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW

VOLATILES						
TOLUENE (UG/L)			DET'N LIMIT = .050		GUIDELINE = 24.0 (B4)	
MAY	.	.	.	BDL	.	BDL
JUN	.	.	.	BDL	.	BDL
JUL	.	.	.	BDL	.	BDL
AUG	.	.	.	BDL	.	BDL
SEP	BDL	.	.	BDL	.	BDL
OCT	.050 <T	BDL	.	BDL	.	BDL
NOV	.100 <T	.150 <T	.	.050 <T	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL

ETHYLBENZENE (UG/L)			DET'N LIMIT = .050		GUIDELINE = 2.4 (B4)	
MAY	.	.	.	BDL	.	BDL
JUN	.	.	.	.150 <T	.	.050 <T
JUL	.	.	.	.050 <T	.	BDL
AUG	.	.	.	.150 <T	.	BDL
SEP	BDL	.	.	.050 <T	.	BDL
OCT	.100 <T	BDL	.	BDL	.	.050 <T
NOV	.100 <T	.100 <T	.	.100 <T	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL

M-XYLENE (UG/L)			DET'N LIMIT = .100		GUIDELINE = 300 (B4)	
MAY	.	.	.	BDL	.	BDL
JUN	.	.	.	BDL	.	BDL
JUL	.	.	.	BDL	.	BDL
AUG	.	.	.	.100 <T	.	BDL
SEP	BDL	.	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL

STYRENE (UG/L)			DET'N LIMIT = .050		GUIDELINE = 46.5 (D2)	
OCT	.700 UCS	.050 <T	.	.200 <T	.	.150 <T
NOV	.650 UCS	.550 UCS	.	.450 <T	.	.050 <T
DEC	.150 <T	.050 <T	.	.200 <T	.	.050 <T

CHLOROFORM (UG/L)			DET'N LIMIT = .100		GUIDELINE = 350 (A1+)	
MAY	.	.	.	150.000	.	150.000
JUN	.	.	.	128.000	.	125.000
JUL	.	.	.	175.000	.	120.000
AUG	.	.	.	150.000	.	145.000

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCK LOMOND WTP) 1988

SITE TYPE	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW
SEP	BDL	.	.	172.600	.	134.300
OCT	BDL	136.600	.	147.600	.	145.600
NOV	BDL	133.000	.	143.000	.	117.000
DEC	BDL	126.000	.	126.000	.	114.000
DICHLOROBROMOMETHANE (UG/L) DET'N LIMIT = .050 GUIDELINE = 350 (A1+)						
MAY	.	.	.	4.550	.	4.450
JUN	.	.	.	4.100	.	3.850
JUL	.	.	.	5.850	.	4.500
AUG	.	.	.	5.200	.	4.700
SEP	BDL	.	.	5.000	.	4.400
OCT	BDL	5.200	.	5.250	.	4.850
NOV	BDL	3.800	.	4.900	.	3.450
DEC	BDL	4.700	.	4.350	.	4.000 APS
CHLORODIBROMOMETHANE (UG/L) DET'N LIMIT = .100 GUIDELINE = 350 (A1+)						
MAY	.	.	.	.200 <T	.	.700 <T
JUN	.	.	.	BDL	.	BDL
JUL	.	.	.	BDL	.	BDL
AUG	.	.	.	BDL	.	BDL
SEP	BDL	.	.	BDL	.	BDL
OCT	BDL	BDL	.	BDL	.	BDL
NOV	BDL	BDL	.	BDL	.	BDL
DEC	BDL	BDL	.	BDL	.	BDL
T-CHLOROETHYLENE (UG/L) DET'N LIMIT = .050 GUIDELINE = 10.0 (C2)						
JUN	.	.	.	BDL	.	BDL
JUL	.	.	.	BDL	.	BDL
AUG	.	.	.	BDL	.	BDL
SEP	BDL	.	.	BDL	.	.050 <T
OCT	BDL	.050 <T	.	.050 <T	.	BDL
NOV	BDL	.100 <T	.	.100 <T	.	.050 <T
DEC	BDL	BDL	.	.050 <T	.	BDL
TOTL TRIHALOMETHANES (UG/L) DET'N LIMIT = .500 GUIDELINE = 350 (A1)						
MAY	.	.	.	154.750	.	155.150
JUN	.	.	.	132.100	.	128.900
JUL	.	.	.	180.850	.	124.500
AUG	.	.	.	155.200	.	149.700
SEP	BDL	.	.	177.600	.	138.700
OCT	BDL	141.800	.	152.850	.	150.450

TABLE 5

DRINKING WATER SURVEILLANCE PROGRAM THUNDER BAY (LOCK LOMOND WTP) 1988

SITE TYPE	WATER TREATMENT PLANT		DISTRIBUTION SYSTEM			
	RAW	TREATED	SITE 1		SITE 3	
			STANDING	FREE FLOW	STANDING	FREE FLOW
NOV	NOL	136.800	.	147.900	.	120.450
DEC	NOL	130.700	.	130.350	.	118.000

Table VI

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BACTERIOLOGICAL			
STANDARD PLATE COUNT MEMBRANE FILTRATION	CT/ML	0	500/ML(A1)
P/A BOTTLE		0	0 (A1*)
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML(A1)
TOTAL COLIFORM BACKGROUND HP	CT/100ML	0	N/A
CHLOROCARONATICS			
HEXACHLOROCYCLOPENTADIENE	MG/L	1.000	450. (D4)
1,2,3-TRICHLOROBENZENE	MG/L	5.000	10000 (I)
1,2,3,4-TETRACHLOROBENZENE	MG/L	1.000	10000 (I)
1,2,3,5-TETRACHLOROBENZENE	MG/L	1.000	10000 (I)
1,2,4-TRICHLOROBENZENE	MG/L	5.000	10000 (I)
1,2,4,5-TETRACHLOROBENZENE	MG/L	1.000	38000 (D4)
1,3,5-TRICHLOROBENZENE	MG/L	5.000	10000 (D4)
HEXACHLOROBENZENE	MG/L	1.0	10. (C1)
HEXACHLOROETHANE	MG/L	1.000	1900. (D4)
OCTACHLOROSTYRENE	MG/L	1.000	N/A
PENTACHLOROBENZENE	MG/L	1.000	74000 (D4)
2,3,6-TRICHLOROTOLUENE	MG/L	5.000	N/A
2,4,5-TRICHLOROTOLUENE	MG/L	5.000	N/A
2,6-A-TRICHLOROTOLUENE	MG/L	5.000	N/A
CHLOROPHENOLS			
2,3,4-TRICHLOROPHENOL	MG/L	50.	N/A
2,3,4,5-TETRACHLOROPHENOL	MG/L	50.	N/A
2,3,5,6-TETRACHLOROPHENOL	MG/L	50.	N/A
2,4,5-TRICHLOROPHENOL	MG/L	50.	2600000 (D4)
2,4,6-TRICHLOROPHENOL	MG/L	50.	5000. (B1)
PENTACHLOROPHENOL	MG/L	50.	60000. (B1)
CHEMISTRY (FLD)			
FIELD COMBINED CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD FREE CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD TOTAL CHLORINE RESIDUAL	MG/L	N/A	N/A
FIELD PH	DIMENSIONLESS	N/A	6.5-8.5(A4)
FIELD TEMPERATURE	°C	N/A	<15 °C(A1)
FIELD TURBIDITY	FTU	N/A	1.0 (A1)
CHEMISTRY (LAB)			
ALKALINITY	MG/L	.200	30-500(A4)
CALCIUM	MG/L	.100	100. (F2)
CYANIDE	MG/L	.001	.20(A1)
CHLORIDE	MG/L	.200	250. (A3)
COLOUR	TCU	.5	5.0 (A3)
CONDUCTIVITY	UMHO/CM	1.	400. (F2)
FLUORIDE	MG/L	.01	2.4 (A1)
HARDNESS	MG/L	.30	80-100(A4)
MAGNESIUM	MG/L	.05	30. (F2)
SODIUM	MG/L	.20	200. (C3)
AMMONIUM TOTAL	MG/L	.002	.05(F2)
NITRITE	MG/L	.001	1.0 (A1)
TOTAL NITRATES	MG/L	.02	10. (A1)
NITROGEN TOTAL KJELDAHL	MG/L	.02	N/A
PH	DIMENSIONLESS	N/A	6.5-8.5(A4)
PHOSPHORUS FIL REACT	MG/L	.0005	N/A
PHOSPHORUS TOTAL	MG/L	.002	.40(F2)
TOTAL SOLIDS	MG/L	1.	500. (A3)
TURBIDITY	FTU	.02	1.0 (A1)

METALS

BORON	UG/L	.200	5000. (A1)
SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
BERYLLIUM	UG/L	.010	0.20 (H)
CADMIUM	UG/L	.050	5.0 (A1)
COBALT	UG/L	.020	1000. (H)
CHROMIUM	UG/L	.100	50. (A1)
COPPER	UG/L	.100	1000. (A3)
IRON	UG/L	4.0	300. (A3)
MERCURY	UG/L	.01	1.0 (A1)
MANGANESE	UG/L	.050	50. (A3)
MOLYBDENUM	UG/L	.020	500. (H)
NICKEL	UG/L	.100	50. (F3)
LEAD	UG/L	.050	50. (A1)
SELENIUM	UG/L	.200	10. (A1)
SILVER	UG/L	.020	50. (A1)
STRONTIUM	UG/L	.050	2000. (H)
THALLIUM	UG/L	.010	13. (D4)
TITANIUM	UG/L	.050	N/A
URANIUM	UG/L	.020	20. (A2)
VANADIUM	UG/L	.050	100. (H)
ZINC	UG/L	.020	500. (A3)

PHENOLICS

PHENOLICS (UNFILTERED REACTIVE)	UG/L	.2	2.0 (A3)
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PESTICIDES & PCB

ALDRIN	NG/L	1.0	700. (A1)
AMETRINE	NG/L	50.	30000. (D3)
ATRAZINE	NG/L	50.	60000. (B3)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700. (G)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300. (G)
GAMMA HEXACHLOROCYCLOHEXANE (LINDANE)	NG/L	1.0	4000. (A1)
ALPHA CHLORDANE	NG/L	2.0	7000. (A1)
GAMMA CHLORDANE	NG/L	2.0	7000. (A1)
BLADEX	NG/L	100.	10000. (B3)
DIELDRIN	NG/L	2.0	700. (A1)
METHOXYCHLOR	NG/L	5.0	100000. (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000. (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	4.0	74000. (D4)
ENDRIN	NG/L	4.0	200. (A1)
ENDOSULFAN SULPHATE (THIODAN SULPHATE)	NG/L	4.0	N/A
HEPTACHLOR EPOXIDE	NG/L	1.0	3000. (A1)
HEPTACHLOR	NG/L	1.0	3000. (A1)
METOLACHLOR	NG/L	500.	50000. (B3)
HIREX	NG/L	5.0	N/A
OXYCHLORDANE	NG/L	2.0	N/A
O,P-DDT	NG/L	5.0	30000. (A1)
PCB	NG/L	20.0	3000. (A2)
O,P-DDD	NG/L	5.0	N/A
PPDDE	NG/L	1.0	30000. (A1)
PPDDT	NG/L	5.0	30000. (A1)
ATRATONE	NG/L	50.	N/A
ALACHLOR	NG/L	500.	35000. (D2)
PROMETONE	NG/L	50.	52500. (D3)
PROPACINE	NG/L	50.	16000. (D2)
PROMETRYNE	NG/L	50.	1000. (B3)
SENCOR (METRIBUZIN)	NG/L	100.	80000. (B2)
SIMAZINE	NG/L	50.	10000. (B3)

POLYAROMATIC HYDROCARBONS

PHENANTHRENE	NG/L	10.0	N/A
ANTHRACENE	NG/L	1.0	N/A
FLUORANTHENE	NG/L	20.0	42000. (D4)
PYRENE	NG/L	20.0	N/A
BENZO(A)ANTHRACENE	NG/L	20.0	N/A
CHRYSENE	NG/L	50.0	N/A
DIMETHYL BENZO(A)ANTHRACENE	NG/L	5.0	N/A
BENZO(E)PYRENE	NG/L	50.0	N/A
BENZO(B)FLUORANTHENE	NG/L	10.0	N/A
PERYLENE	NG/L	10.0	N/A
BENZO(K)FLUORANTHENE	NG/L	1.0	N/A
BENZO(A)PYRENE	NG/L	5.0	10. (B1)

BENZO(G,H,I)PERYLENE	NG/L	20.0	N/A
	DETECTION		
SCAN/PARAMETER	UNIT	LIMIT	GUIDELINE
DIBENZO(A,H)ANTHRACENE	NG/L	10.0	N/A
INDENO(1,2,3-C,D)PYRENE	NG/L	20.0	N/A
BENZO(B)CHRYSENE	NG/L	2.0	N/A
CORONENE	NG/L	10.0	N/A

SPECIFIC PESTICIDES

TOXAPHENE	NG/L	N/A	5000. (A1)
2,4,5-TRICHLOROBUTYRIC ACID (2,4,5-T)	NG/L	50.	280000. (B1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000. (A1)
2,4-DICHLOROPHENOLYLBUTYRIC ACID	NG/L	200.	18000. (B3)
2,4-D PROPIONIC ACID	NG/L	100.	N/A
DIACAMBA	NG/L	100.	87000. (B3)
PICHLORAM	NG/L	100.	2450000. (D3)
SILVEX (2,4,5-TP)	NG/L	50.	10000. (A1)
DIAZINON	NG/L	20.	14000. (A1)
DICHLOROVOS	NG/L	20.	N/A
DURSBAN	NG/L	20.	N/A
ETHION	NG/L	20.	35000. (G)
GUTHION	NG/L	N/A	N/A
KALATHION	NG/L	20.	160000. (G)
MEVINPHOS	NG/L	20.	N/A
METHYL PARATHION	NG/L	50.	7000. (B3)
METHYLTRITHION	NG/L	20.	N/A
PARATHION	NG/L	20.	35000. (B1)
PHORATE (THIET)	NG/L	20.	35. (D2)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
AMINOCARB	NG/L	N/A	N/A
BEMONYL	NG/L	N/A	N/A
BUX (METALKAMATE)	NG/L	2000.	N/A
CARBOFURAN	NG/L	2000.	18000. (D3)
CICP (CHLOROPROPHAN)	NG/L	2000.	350000. (G)
DIALLATE	NG/L	2000.	30000. (H)
EPTAM	NG/L	2000.	N/A
IPC	NG/L	2000.	N/A
PROPOXUR (BAYGON)	NG/L	2000.	90000. (G)
SEVIN (CARBARYL)	NG/L	200.	70000. (A1)
SUTAN (BUTYLATE)	NG/L	2000.	245000. (D3)

VOLATILES

BENZENE	UG/L	.050	5.0 (B1)
TOLUENE	UG/L	.050	24.0 (B4)
ETHYLBENZENE	UG/L	.050	2.4 (B4)
PARA-XYLENE	UG/L	.100	300. (B4)
META-XYLENE	UG/L	.100	300. (B4)
ORTHO-XYLENE	UG/L	.050	300. (B4)
1,1-DICHLOROETHYLENE	UG/L	.100	7.0 (D1)
ETHYLENE DIBROMIDE	UG/L	.05	50. (G)
METHYLENE CHLORIDE	UG/L	.500	1750. (D3)
TRANS-1,2-DICHLOROETHYLENE	UG/L	.100	350. (D3)
1,1-DICHLOROETHANE	UG/L	.100	N/A
CHLOROFORM	UG/L	.100	350. (A1+)
1,1,1-TRICHLOROETHANE	UG/L	.020	200. (D1)
1,2-DICHLOROETHANE	UG/L	.050	5.0 (D1)
CARBON TETRACHLORIDE	UG/L	.200	5.0 (D1)
1,2-DICHLOROPROPANE	UG/L	.050	10.0 (G)
TRICHLOROETHYLENE	UG/L	.100	5.0 (D1)
DICHLOROBROMOMETHANE	UG/L	.050	350. (A1+)
1,1,2-TRICHLOROETHANE	UG/L	.050	.60(D4)
CHLORODIBROMOMETHANE	UG/L	.100	350. (A1+)
TETRACHLOROETHYLENE	UG/L	.050	10.0 (C2)
BROMOFORM	UG/L	.200	350. (A1+)
1,1,2,2-TETRACHLOROETHANE	UG/L	.050	0.17(D4)
CHLOROBENZENE	UG/L	.100	1510. (D3)
1,4-DICHLOROBENZENE	UG/L	.100	5.0 (B1)
1,3-DICHLOROBENZENE	UG/L	.100	130. (G)
1,2-DICHLOROBENZENE	UG/L	.050	200. (B1)
TRIFLUOROCHLOROTOLUENE	UG/L	.100	N/A
TOTAL TRICHLOROETHANES	UG/L	.500	350. (A1)
STYRENE	UG/L	.05	46.5 (D2)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality,
- a flagging mechanism for 'Objective' exceedence,
- a definition of contaminant levels and trends,
- a comprehensive background for remedial action,
- a framework for assessment of new contaminants,
- and an indication of treatment efficiency of plant processes.

Program

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario; currently 44 plants are being monitored. Water supply locations have been prioritized for surveillance, based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit. It is estimated that after 4 years of operation, the program will be monitoring 90 locations.

A major goal of the program is to collect valid water quality data, in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analysed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling in order to acquire complete plant process and distribution system details, and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of the raw (ambient water) and the treated water at the treatment plant, and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled.

Sampling is carried out by operational personnel who have been trained in the applicable procedures.

Comprehensive standardized procedures and Field Test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". All laboratory analyses are carried out by the MOE Laboratory Services Branch.

Data Reporting Mechanism

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP co-ordinator.

DWSP INPUTS AND OUTPUTS

The DWSP INPUTS and OUTPUTS are illustrated in Fig. 1.

PROGRAM INPUTS

PLANT AND DISTRIBUTION SYSTEM DESCRIPTION

The system description includes plant specific non-analytical information acquired through a questionnaire and initial plant

visit. During the initial assessment of the plant and distribution system the questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The PLANT and DISTRIBUTION SYSTEM DESCRIPTION consists of the following seven components.

1. Process component inventory

All physical and chemical processes that the water is subjected to, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. Treatment chemicals

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. The chemical dosages applied on the day of sampling are recorded in DWSP.

3. Process control measurements

Documentation of in-plant monitoring of process parameters (turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in

this section. In-plant monitoring results are generally not retained in DWSP but are retained by the Water Treatment Plant.

4. Design flow and retention time

The hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. The maximum, minimum and average flow as well as a record of the flow rate on the day of sampling are recorded in DWSP.

5. Distribution system description

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. Sampling system

Each plant is assessed for its adequacy in terms of sampling of bacteriological, organic and inorganic parameters. The prime considerations in the assessment and design of the sampling system are:

- i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;
- ii/ the water being sampled is not being modified by the sampling system;
- iii/ the sample tap must be in a clean area of the plant,

preferably a lab area;

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake, discharge and tap), pump characteristics (model, type, capacity) and flow rate.

7. People

This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate Ministry of Environment personnel associated with the plant.

FIELD DATA

The second major input to DWSP is field data.

Field data is collected at the plant and from the distribution system sites on the day of sampling. The field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used,

dosages, flow and retention time on the day of sampling as well as monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analysed according to standardized DWSP protocols to allow for interplant comparison.

LABORATORY ANALYTICAL DATA

The third major input to DWSP is Laboratory Analytical Data.

Samples gathered from the raw, treated and distribution sampling sites are analyzed for approximately 160 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. The parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments parameters may be measured for in a "scan" producing some results for parameters that are not on the DWSP priority list but which may be of interest. The majority of the parameters are measured on a routine basis however, those that are technically more difficult and/or costly to analyse for are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems

may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change notation will e be made and intercomparison data documented.

PARAMETER REFERENCE INFORMATION

The fourth major input to DWSP is Parameter Reference Information

This is a catalogue of information for each substance analysed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database.

An example is shown in fig. 2.

A written copy (hard version) of the Parameter Reference Information will be available in the near future and is a new and sophisticated enhancement to the DWSP.

PROGRAM OUTPUTS

There are four major program outputs, Query, Action Alert, Report Generation and the Annual Report.

QUERY

All DWSP information is easily accessed through the Query function, therefore anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

ACTION ALERTS

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the publication, Ontario Drinking Water Objectives (ISBN 0-7729-2725-1 revised 1983). This publication contains health-related Maximum Acceptable Concentrations for thirty substances. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, other agency guidelines which are documented in the Parameter Reference Information may be used. If these guidelines are exceeded the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

REPORT GENERATION

Custom reports can be generated from DWSP to meet the needs of the regions and to respond to public requests.

ANNUAL REPORTS

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG. 1

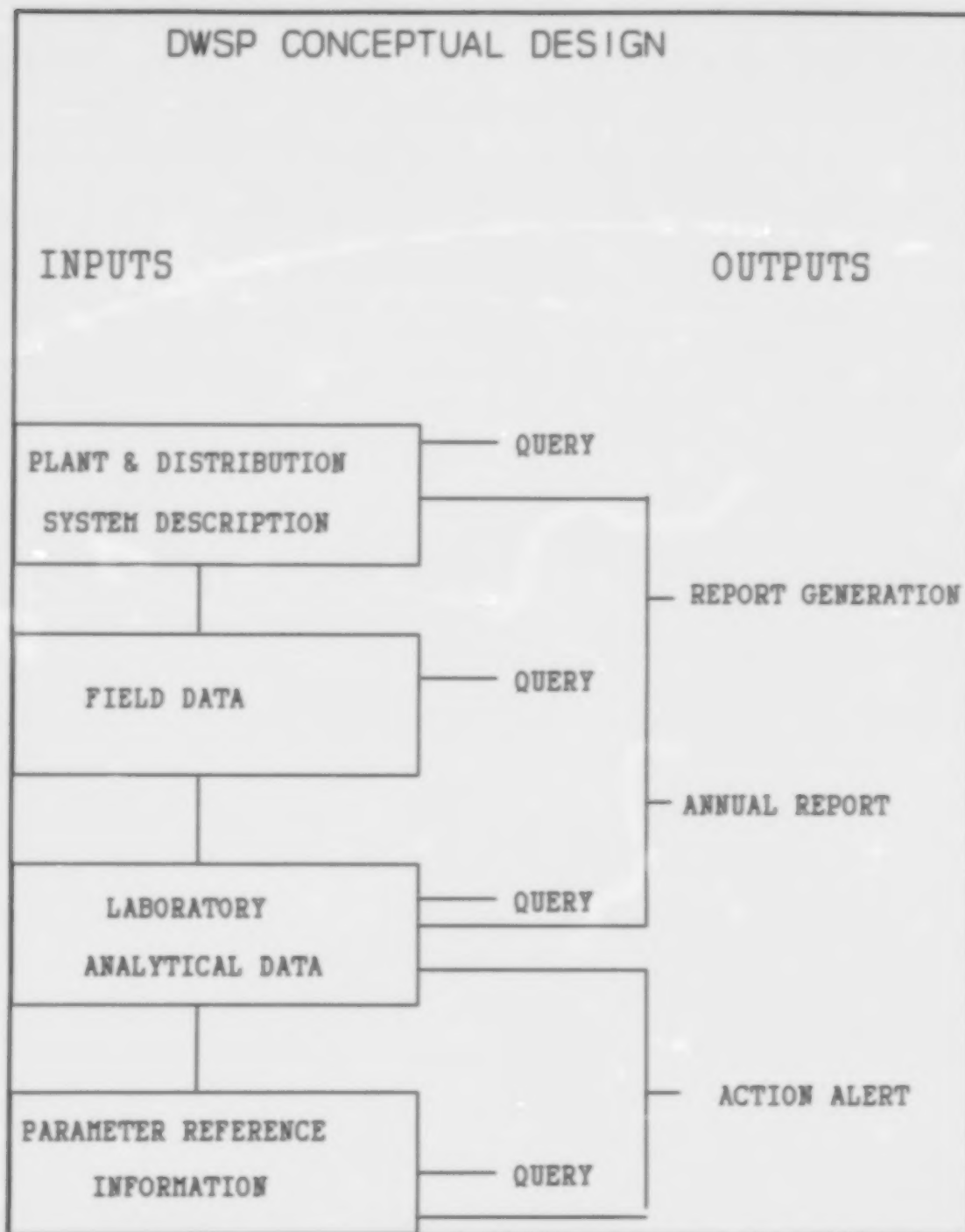


FIG.2

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

(B2001P)

PARAMETER REFERENCE

BENZENE

SOURCE FROM	TO	METHOD	TARG	UNIT	NOTE
EPA C 86/04		NOMETH	.00	063000 UG/L	RMCL
EPAA C 80/11		NOMETH	6.60	063000 UG/L	
FERC C 84/05		NOMETH	1.00	063000 UG/L	
WHO C 84/01		NOMETH	10.00	064000 UG/L	

DESCRIPTION: NAME: BENZENE

CAS#: 71432

MOLECULAR FORMULAE: C_6H_6

DETECTION LIMIT: (FOR METHOD POCODO) 0.05 UG/L

SYNONYMS: BENZOLE, COAL NAPHTHA, CARBON OIL (27),
CYCLOHEXATRIENE (41)CHARACTERISTICS: COLOURLESS TO LIGHT YELLOW, MOBILE,
NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE,
AROMATIC, VAPOURS BURN WITH SMOKING FLAME (30)

PROPERTIES:

SOLUBILITY IN WATER: 1780-1800 MG/L AT 25 DEG C (41)

THRESHOLD ODOUR: NO DATA

THRESHOLD TASTE: 0.5 MG/L IN WATER (39)

ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING
ORGANISMS, APPEARS TO BIOACCUMULATE IN ANIMAL
TISSUES THAT EXHIBIT HIGH LIPID CONTENT OR ARE
MAJOR METABOLIC SITES (LIVER, BRAIN), SMALL
QUANTITIES EVAPORATE FROM SOIL OR DEGRADE QUICKLYSOURCES: PETROLEUM REFINING, SOLVENT RECOVERY, COAL
TAR DISTILLATION, FOOD PROCESSING, TANNING.USES: PREPERATION OF ETHYL BENZENE USED AS A STYRENE
MONOMER, DETERGENTS, NYLON, AS INTERMEDIATE IN
PESTICIDE PRODUCTION, SOLVENT IN RUBBER INDUSTRY,
DEGREASING AND CLEANSING AGENT, GASOLINE.TOXICITY: RATING 4 (VERY TOXIC); ACUTE - IRRITATES
MUCOUS MEMBRANES, SYMPTONS INCLUDE RESTLESSNESS,
CONVULSIONS, DEPRESSION, RESPIRATORY FAILURE;
CHRONIC - ANEMIA AND LEUKEMIA (45).

CARINOGENICITY: HUMAN CARCINOGEN AND MUTAGEN

REMOVAL: GAC ADSORPTION, PRECIPITATION WITH ALUM
FOLLOWED BY SEDIMENTATION, COAGULATION AND
FLOCCULATION, SOLVENT EXTRACTION, OXIDATION (41).

MOLECULAR WEIGHT: 78.12 GRAMS

MELTING POINT: 5.5 DEGREES C (27)

BOILING POINT: 80.1 DEGREES C (27)

SPECIFIC GRAVITY: 0.879 AT 20 DEGREES C (27)

VAPOUR PRESSURE: 100 MM AT 26.1 DEGREES C

HENRY'S LAW CONSTANT: 0.00555 ATM M_2 /MOLE

LOG OCT./WATER PAR.COEFF:K=1.0 1/N=1.6 R=.97 PH=5.3

Appendix B

DWSP SAMPLING GUIDELINE

i) RAW and TREATED at PLANT

General Chemistry	-500 mL clear plastic bottle -rinse bottle with sample three times and discard water -fill to line
Bacti	-250 mL clear glass bottle with white seal on cap -do <u>not</u> rinse bottle; preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (Caution: HNO_3 is corrosive)
Volatiles (OPOPUP)	-250 mL clear glass bottle -do <u>not</u> rinse bottle -tilt bottle when filling -fill bottle completely; there should be no air bubbles.
Organic (OWOC), (OWTRI), (OAPAHX)	-1 liter brown glass bottle per scan -do <u>not</u> rinse bottle -fill to approx. 1" from top -when 'special pesticides' are requested three extra bottles per sample must be submitted
Cyanide	-500 mL clear plastic bottle -do <u>not</u> rinse bottle -fill to approx. 1" from top -add 10 drops sodium hydroxide (Caution: NaOH is corrosive)

Mercury

- 250 mL clear glass bottle
- rinse bottle and cap three times, discard then fill to top of label
- add 20 drops each nitric acid and potassium dichromate
- (Caution: HNO_3 and KCrO_4 corrosive)

Phenols

- 250 mL clear glass bottle
- do not rinse bottle
- fill to top of label as marked

Steps

1. Let cold water tap run for several minutes.
2. Record time in submission sheet.
3. Record temperature on submission sheet.
4. Fill up all bottles as per instructions.
5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL clear plastic bottle -rinse bottle with sample three times and discard -fill to line
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (Caution: HNO_3 is corrosive)

Steps:

1. Record time on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL clear plastic bottle -rinse bottle with sample three times and discard water -fill to line
Bacti	-250 mL clear glass bottle with white seal on cap -do <u>not</u> rinse bottle; preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL clear plastic bottle with white lid -rinse bottle and cap three times, discard -fill to line -add 10 drops nitric acid (Caution: HNO_3 is corrosive)
Volatiles (OPOPUP)	-250 mL clear glass bottle -do <u>not</u> rinse bottle; preservative has been added -tilt bottle when filling -fill bottle completely; there should be no air bubbles
Organic (OWOC), (OWTRI)	-1 liter brown glass bottle per scan -do <u>not</u> rinse bottle: preservative has been added -fill to approx. 1" from top
Cyanide	-500 mL clear plastic bottle -do <u>not</u> rinse bottle: preservative has been added -fill to approx. 1" from top -add 10 drops sodium hydroxide (Caution: NaOH is corrosive)
Mercury	-250 mL clear glass bottle -rinse bottle and cap three times, discard then fill to top of label -add 20 drops each nitric acid and potassium dichromate (Caution: HNO_3 and KCrO_7 corrosive)

Steps:

1. Record time on submission sheet.
2. Let cold water flow for ten minutes.
3. Record temperature on submission sheet.
4. Fill all bottles as per instructions.
5. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.